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STORES AND MATERIALS CONTROL

**Including Procurement by Manufacture
and by Purchase**

By

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PREFACE

This book presents the general subject of the procurement and handling of materials, from the initiation of the order for their purchase or manufacture to the shipment of the finished product. It thus covers storeskeeping, manufacturing and purchasing, treating all from the point of view of the production executive. While there are several useful books dealing with particular portions of the subject—with the work of the purchasing department, or the production department—there appears a need for a work covering in a comprehensive way all the important phases of materials control.

The effort has been made to explain in detail the procedure to be followed in an effective system of materials control in both large and small organizations. The basic principles apply to both classes alike, and in most cases the practice is the same. Special attention has been given to the procedure of the large plant, inasmuch as there the volume of work, necessitating close study of every detail, exhibits the problems involved on a scale which reveals clearly their essential elements. Details of practice should receive no less serious attention in the small concern than in the large one, though necessarily attended to by a smaller force and requiring a less detailed system. The only safe policy for the small plant that is to hold its own today, lies in simplifying and adapting the methods tested out in the big plant and found essential to sound operation, without slurring over or emasculating them.

To show more plainly the steps in the necessary procedure and their interrelations a series of forms has been given, illustrating both simple and complicated systems of materials control and those operating under special conditions. It is

believed that these are shown in sufficient detail and sufficient quantity to enable ready adaptation to meet individual requirements.

The author is indebted to many individuals and firms for material, suggestions, and criticism. Particular mention should be made of the assistance received from Mr. W. A. Langford, past president of the New York Association of Purchasing Agents, and Mr. L. F. Boffey, editor of *The Purchasing Agent*, in connection with a course of lectures on "Materials Control" given by the author at the New York University School of Commerce. In the same connection the author is indebted also to Messrs. Henry Hardenberg, general purchasing agent of The New Jersey Zinc Company; F. H. Hoyt, purchasing agent of The Standard Oil Company of New York; Fred Macklin, purchasing agent of The Consolidated Gas Company of New York; C. H. Weakland, purchasing agent of The National Cloak and Suit Company; and C. Frank Schwep, purchasing agent of The Ingersoll-Rand Company. Appreciation must also be expressed for assistance received from Mr. Thomas Conyngton, who is largely responsible for the chapter on "Some Legal Aspects of Purchasing."

Special mention is due likewise to Mr. R. E. Anderson, treasurer, and Mr. W. T. Birney, purchasing agent of the Winchester Repeating Arms Company, former employers; to C. E. Knoepfel and Company, Inc., industrial engineers, with whom the author has been associated, for permission to use material and data from their files; and to Mr. J. P. Jordan and Mr. A. F. Stock, former members of the latter organization, for valuable criticisms and suggestions.

MADISON CARTMELL

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CONTENTS

Part I—Introductory

CHAPTER		PAGE
I	THE PROBLEM OF MATERIALS CONTROL	3
	The Three Phases of Management	
	The Importance of Materials Control	
	The Control of the Inventories	
	The Cycle of Manufacturing Operation	
	The Test of Efficiency	
	—Materials Control and Discipline	
II	THE ORGANIZATION OF CONTROL	9
	Effect of Lack of Organization	
	The Need for Specialization	
	The Nucleus of Control	
	Types of Manufacture	
	The Storeskeeping Department	
	Administration of Materials Control Department	
	Functions of the Control Department	
	The Decentralization of the Storesrooms	
	Relation of Purchase and Control Departments to the Plant	
	Other Service Departments—General and Cost Accounting	
	Traffic Department	
	The Inspection Department	
	The Engineering Department	
	The Office Manager	

Part II—Principles of Control

III	THE RECORDS AND MECHANISM OF CONTROL	25
	General Purposes of Control	
	1. The Upkeep of the Inventories	
	2. The Care of Materials	
	3. Correlation of Production and Sales Program	
	4. Materials as an Element of Cost	
	5. Statistical Feature of Stores Control	
	6. Classification and Valuation of Inventories	
	Illustration of Procedure	
	Classification of Orders	
	Stores Orders	
	Plant—Increase and Expenses Orders	
	Charging the Stores Accounts	

CHAPTER		PAGE
IV	THE STORES RECORD FORM	39
	Purposes of the Stores Record ✓	
	Information Furnished by Stores Record	
	General Purposes of Information	
	Methods of Keeping the Record	
	Development of Stores Record Form	
	Control of Ordering by "Maximum" and "Minimum" Quantities	
	Keeping Track of Available Quantity	
	Co-ordinating Requirements and Schedules	
	Appropriating Material	
	"Ordering Quantity" and "Ordering Point"	
	"Running Totals" versus "Balances"	
	Heading of a Stock Record	
	Opening a Stores Record	
	The Handling of Various Classes of Materials	
	Increasing Inventories	
	The Unclassified Stores Record Sheet	
V	PRICING THE STORES RECORDS	58
	Necessity of Accurate Prices	
	Advantages of Pricing Stores Record	
	Recording Values	
	Components of Material Costs	
	Predetermining Costs of All Materials	
	Methods of Pricing Requisitions	
	Actual Costs versus Standard Costs	
	Standard Costs	
	Actual Cost Methods of Pricing Requisitions	
	Average Cost Method for Pricing Requisitions	
	Pricing Requisitions at Current Prices	
	Inventory Adjustments	
VI	OPERATING THE STORES RECORDS	70
	Reporting Delivery of Materials to Stores	
	The Stores Requisition	
	Routing the Stores Requisitions	
	Handling the Requisition in the Storesroom	
	Posting Requisitions	
	The Stores Return	
	Issuing by Specification	
	Standard Parts List Record	
	The Order Requisition	
	Mechanical Posting of Records	
	Accuracy of Stores Records	
	Errors of the Storesroom	
VII	CLASSIFICATION AND SYMBOLIZATION	86
	Business Classification	
	Advantage of a Uniform System	
	Planning a Classification System	

CONTENTS

vii

CHAPTER	PAGE
The First Steps in Classification Symbolization Use of Symbols Facilitates Clerical Work Use of Symbols Maintains Standards Numerical and Alphabetical Systems Requirements of Symbols	
VIII CLASSIFICATION AND SYMBOLIZATION OF MATERIALS .	94
— Problem of Classification	
— Function of Control Accounts	
— Classification of Accounts	
— Classification of General Stores	
— Symbolization of General Stores	
— Two Rules for Symbolization	
Classification and Symbolization of Service Department Supplies	
Symbolization of Unclassified Materials	
Classification and Symbolization of Products	
Classification of Special and By-Products	
Classification and Symbolization of Other Activities	
Classification and Symbolization of Adjuncts	
IX SYMBOLIZATION OF COST RECORDS	107
Function of Cost Accounting	
Monthly Reports	
The Balance Sheet	
The Profit and Loss Statement	
The Burden and Cost Statement	
The Budget	
The Material Accounts	
The Cost Ledgers	
Explanation of the Chart	
Inventory Account Symbols	
Order Symbols	
X THE COSTING OF ORDERS	117
Methods of Costing Orders	
Cost Documents	
Handling the Cost Reports—The Time Cards	
Handling Stores Requisitions	
Handling the Stores Returns	
Reporting Deliveries to Stores	
Journal Entries	
Handling Expense Debit Slips	
Making Up Expense and Burden Statements	
Tabulating Production Order Costs	
The Work in Process Control Accounts	
XI CONTROL OF INVENTORY	131
Effect of Policy on Inventory	
Inventory Carrying Charges	

CHAPTER	PAGE
	The Consideration of Quality Control Procedure Determination of Ordering Points Determination of Minimum Ordering Quantity Economic Minimum of Manufacturing Cost Graphing the Consumption Control of Finished Product Inventory by Production Orders Planning for Materials and Supplies Control of Work in Process Accounts Control of Supplies and Non-Productive Materials
XII	STANDARDS AND SPECIFICATIONS 142
	Definition and Purpose Advantages of Standardization Determination of Standards Organization for Standardization Example of Standardizing Materials Example of Standardizing Product Specifications Model Specifications Specifications in the Purchasing Department Maintaining Standards Periodical Revision of Standards and Specifications
XIII	ARRANGING AND EQUIPPING THE STORESROOM 156
	Functioning of the Storage Workers Planning the Storesroom Written Standard Practice Directions Location of the Storesroom Size of the Storesroom Storing Materials Allotment of Space in the Storesroom Aisles Symbolizing the Storage Spaces Mechanical Aids Standard Storage Units Bin Subdivisions Skids and Trucks Counting Machines Branch Storesrooms
XIV	STOWING MATERIAL 168
	Definition of Stowage Where Goods Should Be Stowed The Double-Space Method Treatment of Special Items Keeping Items Distinct Identifying the Materials The Bin Tag Surplus Stock Rules for Good Piling

CONTENTS

ix

CHAPTER	PAGE
	The Unit of Stowage
	Piling
	Counting
	Removing Goods
	Change of Location
	Verifying Inventories
	The Delivery System
	Procedure in Filling Requisitions
XV	TAKING INVENTORIES 183
	Steps in Establishing Materials Control
	Necessity for Taking Inventory
	Physical Inventory
	Advantages of Regular Checking Counts
	The Duplicate Tag Method of Taking an Inventory
	Preparations for Inventory
	Inventory Instructions
	Inventory Period
	Directing and Taking the Inventory
	Classification of Items to be Inventoried
	Special Instructions for Departments
	Inventory Tags
	Filling in the Tags
	Supervising and Comparing Inventory
	Pricing Inventory Items
	Final Steps
XVI	ORGANIZATION OF THE MATERIALS CONTROL DEPARTMENT 201
	Summary of Responsibility
	Relation of Storeskeeping to Other Functions
	Relations with a Production Control Department
	Co-operation between the Storeskeeping Groups
	Communicating between the Two Groups
	Organizing the Materials Control Department
	Functional Organization
	Function of the Planning Section of the Stores Records Division
	Personnel of the Planning Section
	The Function of the Recording Section
	Function of the Scheduling Section
	Function of the Accounting Section
	Organizing the Small Materials Control Department
	Organizing the Storage Division
	The Stowage Section of the Storage Division
	The Delivery Section
	Part III—Procurement by Manufacture
XVII	ORGANIZATION OF THE PRODUCTION CONTROL DEPARTMENT 217
	Function of the Department
	Order Handling Procedure

CHAPTER	PAGE
The Production Control Department The Production Control Manager Materials Control Supervisor Order Control Supervisor The Dispatching Supervisor Tool Control Supervisor	
XVIII GRAPHIC PRODUCTION CONTROL	224
Necessity for Graphic Method Function or Purpose Means or Machinery of Performance Description of Control Boards Control Board Operation Description of Dispatch Boards Dispatch Board Operation	
XIX OPERATION OF PRODUCTION CONTROL MECHANISM	239
Origin of the Production Order Standard Practice Records Standard Parts List Record Standard Production Analysis Records Cost Sheet Identification, Instruction and Routing Cards Workers' Time Cards Standard Operation Symbol Code Stores Requisitions Scheduling Jobs on Control Board Registering Material Available for Production Forwarding Requisitions to Storage Division Dispatching Work to Shops Starting and Quitting Jobs and Registering Accomplish- ments Inspection Reports Computations Made by Dispatchers Handling Irregular Conditions Registering on Control Board Progress on Orders Posting Accomplishments to Progress and Follow-Up Records Making Up the Pay-Rolls Departmental Efficiency Reports Departmental Idle Time Reports	
Part IV—Procurement by Purchase	
XX THE FUNCTION OF THE PURCHASING DEPARTMENT	257
Preliminary View of the Purchasing Department Defects of Departmental Buying Specialized Purchasing The Purchasing Agent Increased Profits through Savings	

CONTENTS

xi

CHAPTER	PAGE
Good Buying	
Records	
Contact with the Outside	
Personal Relations with Vendors	
Justifying Its Existence	
The Seven Stages of Purchasing	
1. Determining the Article	
2. Knowing the Market	
3. Selecting the Vendor	
4. Determining the Price	
5. Making the Contract	
6. Effecting Delivery	
7. Completing the Contract	
The Purchasing Department and the Organization	
XXI THE ARTICLE	273
The Selection of the Right Article	
Quality versus Price	
Essential Knowledge	
The Use of the Article	
Questionable Requisitions	
Technical Knowledge	
Specifications	
Classes of Specifications	
Materials from Vendor's Stock	
Materials Record	
An Illustrative Record	
Origin of Purchase Order Requisitions	
Checking	
Use of Data	
Orders Applying on Blanket Contracts	
The Quantity	
Control of Requisitions	
Fixing the Price	
XXII THE MARKET	290
The Background	
Forecasting the Market—General Information	
Statistical Agencies	
Graphic Presentation	
How to Make a Graph	
Specific Information	
Supply and Demand	
The Personal Side	
Correlation of Requirements and the Market	
Kinds of Prices	
Information on Vendors	
Delivery Conditions; the Terms of Sale	
XXIII SELLER AND BUYER	311
Interrelation of Seller and Buyer	
Personal Contact with Vendors	

CHAPTER	PAGE
Attitude of the Purchasing Agent The Legal and the Personal Ties Sources of Data Credit Information Forms Gratuities and Bribery Acceptance of Favors and Courtesy Vendor Expects Correct Purchase Orders The Purchaser's Requirements Service Record Confidence	
XXIV THE PRICE	328
Preparing to Issue a Purchase Order Quotation File Request for Bids Tabulation of Bids The Price Competitive Prices Price Maintenance Kinds of Price The Definite Price Price Based on Performance Current Prices The Cost—Plus Contract List and Net Prices Transportation Charges f.o.b. Destination Discounts for Prompt Payments Trade Acceptances	
XXV THE WRITTEN CONTRACT	347
Kinds of Contracts Blanket Contracts The Individual Purchase Order Fixing the Date of Delivery Difficulty of Effecting Prompt Delivery Advance Information of Factory Requirements Allowance for Time in Transit Time for Completion The Copies of the Purchase Order Inspection of Purchase Order Vendor's Acceptance of the Order	
XXVI EFFECTING THE DELIVERY	361
Vendor Naturally Remiss Follow-Up Work Appeal to Sales Agent Progress Reports Rush Orders "Ship and Trace" Mechanism of Follow-Up Work Following up the Transportation Companies	

CONTENTS

xiii

CHAPTER

PAGE

Transportation Charges
Freight Rates
Bills of Lading
Demurrage and Damage Claims
Routings
Discontinuing the Follow-Up

XXVII THE COMPLETION OF THE PURCHASE CONTRACT . . . 377

The Purchaser's Obligation
Payment of the Invoice
Registration of the Invoice
The Flagging of Invoices
Checking the Invoice
Checking the Transportation Charges
Receiving and Checking the Goods
Adjustment of Discrepancies
Payment of Invoice

XXVIII SOME LEGAL ASPECTS OF PURCHASING 401

Necessity of Familiarity with Law
What Constitutes Our Law
Definition of a Contract
Meaning of Agreement
Acceptance of an Offer
Value of Having Contracts in Writing
The Parties to an Agreement
Consideration
Lawful Purpose
Sales Contracts
Caveat Emptor
Express Warranties
Expressions of Opinions
Implied Warranties
Destruction of Subject Matter
Mistakes in Contracts
What Constitutes Fraud
Alteration of Contracts
Interpreting a Contract
Rules of Interpretation
Assignment of Contract
Acting as an Agent
General Agents
Special Agents
Liability of Principal

XXIX ORGANIZATION AND PERSONNEL 419

Two Types of Purchasing Control
Organization of Subsidiary Offices
The Central Office's Purchases for Distant Plants
Control of Subordinate Purchasing Departments
Qualifications of a Purchasing Agent

CHAPTER	PAGE
Duties of Purchasing Agent	
Planning Division	
Quotation Division	
Scheduling Division	
Invoice Division	
Assistant Purchasing Agent	
The True Function of the Purchasing Agent	
His Characteristics	
His Position in the Organization	
Part V—Adopting a System	
XXX SYSTEMS, RECORDS, AND FORMS	437
Requirements of a System	
Systems Not Universally Applicable	
Delegation of Authority	
Revising a System	
Records	
Reliability and Adequacy	
Availability and Timeliness	
Permanency	
Development of Records	
Purchasing Operations and Records	
Forms—Advantages and Objections	
Forms Insure a Fixed Policy	

FORMS

FORM	PAGE
1. Chart Showing the Paralleling Procedures for Procuring Materials by Purchase and by Manufacture	18
2. Organization Chart of a Large Plant Operated According to Modern Methods	20
3. Chart Showing Elements of Selling Price	29
4. Simple Perpetual Inventory with Price and Value Spaces	43
5. Simple Stores Record Form with "Ordered" Columns	45
6. Stores Record	46
7. Modern Stores Record Carrying Balances	47
8. Modern Stores Record with Appropriated and without Balance Columns	51
9. Order to Stock Material	55
10. Unclassified Stores Record	56
11. Report on Cost of Manufactured Material	61
12. Stores Requisition	72
13. Stores Requisition	73
14. Slip to Accompany Requisition Returned for Correction	76
15. Notice that Material Is Not on Hand	77
16. Stores Return	79
17. Production Order Requisition	81
18. Notice of "Danger Point"	82
19. Daily Record of Balance	83
20. Request for Count of Stock	85
21. Chart Showing Classification and Symbolization of Main Accounts	97
22. Chart Representing the Relationship Subsidiary Ledgers Bear to General or Main Ledger	112
23. Summary of Materials Used—Credit	122
24. Summary of Materials Used—Debit	123
25. Journal Voucher	126
26. Expense Ledger Slip	127
27. Cost or Estimate Sheet	129
28. Graphic Record of Consumption	138
29. Bin Tag	173
30. Surplus Stock Tag	175
31. Notice of Change of Location of Material	179
32. Stores Delivery Tag	181
33. Inventory Tag for Raw Material and Supplies	194
34. Inventory Tag for Finished Product or Component Parts	195
35. Inventory Tag for Work in Process	196
36. Inventory Record for All Materials in Stores	199
37. Inventory Record for Work in Process	199
38. Organization Chart of Materials Control Department—Stores Record Division	205
39. Organization Chart of Materials Control Department—Storage Division	212

FORM	PAGE
40. Organization Chart of Production Control Department	218
41. Control Board (Opposite)	224
42. Dispatch Board (Opposite)	226
43. Standard Machine Practice Card	227
44. Standard Parts List Record	228
45. Standard Production Analysis Record of Auxiliary Small Tool Requirements	228
46. Standard Production Analysis Record of Material Requirements	228
47. Progress and Follow-Up Record	230
48. Identification Instruction, and Routing Card	231
49. Material Requisition Card	232
50. Material Credit Card	232
51. Direct Labor Time Card	233
52. Process and Final Inspection Report	233
53. Idle Equipment Report	234
54. Control Progress Strip	235
55. Signal Tags for Control Board	236
56. Chart of Sources of Stores Receipts and Disbursements (Opposite)	252
57. Purchase Order Requisition	287
58. Extract from Report to Buyers (Babson)	294
59. Summary of Statistical Agency Reports	295
60. Graph Showing Price in Dollars per Gross Ton of Basic Pig, Valley, and Steel Bars, Pittsburgh	297
61. Graph Showing Fluctuations in Price of Eggs in United States as Compared with Average of Monthly Figures for Four Years	299
62. Price and Production Graph (Babson)	300
63. Graph Showing How the Value of Three Relations Diverge from a Common Point as the Relationships Change	301
64. Weekly Report of Materials Control Department	306
65. Estimate of Consumption and Balances	307
66. Record of Sources of Supply	309
67. Vendor's Record of Buyer's Personality	314
68. Report on Customer	315
69. Purchasing Department Record of Dealers	326
70. Contract Record	329
71. Quotation and Past Purchase Order Record	330
72. Purchasing Agent's Request for Quotation	332, 333
73. Trade Acceptance Forms	344
74. Purchase Order	354-356
75. Supplementary Purchase Order	359
76. Vendor's Acceptance of Order	360
77. Post-Card for Routine Follow-Up of Delivery	363, 364
78. Request to Vendor to Trace Shipment	366, 367
79. Record of Purchase Material Received	376
80. Typical Invoice	380
81a. Invoice Flag for Entry of Checking	381
81b. Invoice Rubber-Stamp to Replace Flag	381
82. Purchase Materials Received Report	386, 387
83. Back of Defective Material Rejection Report	389
84. Memorandum of Discrepancy in Invoice	391
85. Countercharge Memorandum	393
86. Credit to Vendor Memorandum	393

FORMS

xvii

FORM	PAGE
87. Requisition for Check	394
88. Vouchers Payable Register	396
89. Remittance Letter	398
90. Cash Disbursements Register	399
91. Chart Showing Purchasing Department Organization	425

STORES AND MATERIALS CONTROL

PART I INTRODUCTORY

CHAPTER I

THE PROBLEM OF MATERIALS CONTROL

The Three Phases of Management

The art of industrial management is to make the best possible use of the raw materials purchased, the men employed, and the capital invested in the business. Broadly considered, therefore, the management of a manufacturing business may be divided into the three phases of control of materials, of men, and of money. These three factors form the legs of the tripod of management; hence none of the three can be considered as more important than the other two. Methods of control aiming to make more effective use of one must exert a more or less beneficial influence upon the others. The instability of one will affect the stability of the others.

Though the three phases of management are thus interdependent, the art of management cannot be profitably studied unless each of the three phases is separately taken up as a problem by itself. Each leg of the tripod should be as carefully fashioned and as strongly constructed as possible, before the three pieces are ready to be welded together.

The Importance of Materials Control

The observation, however, that none of the three phases of management can be considered as more important than the other two and that all three must be given full consideration in any scheme of management is subject to some qualification. The object of business is to sell something at a profit—of a manufacturing business, to sell the thing produced or transformed at a profit. The manufacturing enterprise exists by

virtue of the raw materials that enter the factory at one door and leave as finished goods at another door. Capital is invested in buildings, machinery, and other equipment for the purpose of making this transformation. The measure of the effective use of men and capital is determined by the economy, that is, the best possible use of time and materials between the entry of the raw materials into the factory and the egress of the finished goods sold. If we use the term "materials" in its broadest sense and in the sense used throughout this book as including the raw materials, the manufactured parts made therefrom, and the finished goods assembled from the manufactured parts, we may say that the control of materials is the foundation of all other forms of control and therefore of successful management.

The truth of this assertion is made clearer if we consider the relation of materials control to the work of production. The cost of a manufactured product is composed of the three factors of materials, labor, and overhead. To reduce these costs to the lowest possible minimum per unit of production consistent with the quality of the output is the aim of industrial management. Economies in overhead depend upon the most effective use of plant and equipment. Economies in labor depend upon the direction of effort into its most productive channels. Both these aims are thwarted and the effort to economize is largely nullified, if materials are lacking when required and labor and machines stand idle; or if materials of poor quality or the wrong kind have been purchased and work is spoiled and rejected, with the attendant waste of labor and overhead; or if materials are stored in excess of manufacturing requirements and working capital is needlessly tied up in stock and floor space is put to unprofitable use; or if materials are not stored and accounted for properly, and loss from waste, misuse, and careless handling results.

The Control of the Inventories

How closely related is the care and control of the inventories to the fundamental principles of management is not generally realized judging from the inadequacy of most systems of materials control. The profits of a manufacturing concern are largely dependent upon the continuous and unbroken operation of the production departments. The economical operation of these departments requires that they be supplied with materials without cessation. Every hitch in the supply, every breakdown of the flow from raw materials to finished goods, involves the wastes of lost time and idle machines. Therefore, materials must be procured and stored in the requisite quantities to supply every need of production.

Yet the very necessity of maintaining an adequate supply of everything needed for factory operation tends to create the evils of oversupply and waste. Without effective control a large amount of working capital may be invested in materials which will not be used for months and even years to come, or never be used at all because of changes in style or manufacturing policy. Without adequate control also, materials may be transformed into more of one kind of finished parts and less of another kind than is required. Sales may be lost and production orders may be held up in consequence. It will thus be seen that the control of materials is fundamental not only to the orderly progression of a production program but also to the carrying out of a sales program and policy.

Thus materials control in its broadest aspect embraces the control of the inventories of raw materials, parts, and supplies, of work in process, and of finished goods. Materials must flow into the factory in the volume required for production but without bringing into storage more than the minimum quantities required to fill current needs. If the product is an assembled article or machine, parts must be manufactured in the volume required, and yet their stock must be maintained at

its lowest possible figure consistent with uninterrupted manufacture. If customers' orders are filled from stock—as is the practice in the majority of businesses—fluctuations in the demand for finished goods or changes in their quality or style should at once react to the storesroom where the potential goods are stored in their raw state, and then from the storesroom to the purchasing department, if they must be purchased, or to the factory, if they must be made.

The Cycle of Manufacturing Operation

Storeskeeping is one phase only of the cycle of materials control. In any discussion of storeskeeping and the routine work involved, it is usual to begin with a description of the purchasing organization and the nature of its work. A little reflection, however, will show that the function of purchasing is dependent upon the sales and production policies and is in no respect an initial function or process that sets in operation other functions and processes. For this reason it has seemed preferable to the writer to arrange the order of presentation in this book with some regard to the sequence of materials control in actual factory operation and to present first a general outline of the problems involved and the mechanism employed in controlling the inventories before discussing more detailed matters. Hence the work and mechanism of the purchasing department is described in the fourth part of this book, because, as explained, purchasing, though preceding the beginning of the cycle of manufacturing operations, is subservient to the control of the inventories.

The Test of Efficiency

The ideal condition of the inventories of a plant would be one in which the turnover of all raw materials synchronized with the time needed to procure them in convenient quantity, in which all finished parts were assembled at periodical inter-

vals into finished stock, and in which few items of stock remained unsold for any length of time. The last of these three circumstances existed in the sellers' market experienced in recent years when buyers were eager to accept anything manufacturers had to offer. In such a market prices are high enough to pay for inefficiencies in management and wastes in production and still leave a fair margin of profit. When, however, supply equals or exceeds demand and the market belongs to the buyer, the state of the inventories very quickly reflects the relative inefficiency of the management.

Just as the enterprise and business acumen of the merchant are reflected in his turnover, in the freshness and variety of his stock, and in the freedom of his shelves from shop-worn and unsalable goods, so the efficiency with which the average manufacturing plant is managed can be narrowly gauged by a close inspection of its inventories. The statistics of mercantile agencies show that most business failures are due to mismanagement or lack of capital. Both causes mean the same thing—lack of control, and this lack manifests itself most in tying up working capital in useless or unsalable inventories.

Materials Control and Discipline

Just as the individual is largely rated by others at his own valuation, so the inventories—using the term in its widest sense—are valued by employees at the valuation placed upon them by their employer. If materials can be withdrawn from stores without proper authority, if spoiled work and scrap are allowed to accumulate around the plant, if employees are permitted to help themselves to such supplies for their own use, it is human nature for the workers to place a low valuation upon the things for the use or possession of which they are not held strictly accountable. Plant discipline begins with such accountability. Adequate materials control is the first step in the inculcation of such discipline.

Indeed the installation of methods of controlling materials is an essential prerequisite to the installation of methods of controlling the production of workers by measuring the time spent in given operations or in producing certain quantities of goods. Obviously the time spent in processing materials should not be measured and recorded unless the quantity and value of the material used is also measured. Although in every industry some attempt is made to allocate the time of productive workers to the particular processes or operations on which they are engaged, or to the particular goods produced, in few plants is this control carried out in such detail as to bring to light all losses and wastes due to the mishandling of materials or to their lack at the point where required. Only by uncovering such leaks and wastes can the losses due to wasted effort and spoiled or useless material be eliminated. It is by the elimination of such losses that the utmost economy in manufacture is attained.

CHAPTER II

THE ORGANIZATION OF CONTROL

Effect of Lack of Organization

Some years ago the writer was employed in a plant where agricultural implements of different types were assembled from the parts kept in stock to fill customers' orders. When an order had to be filled for a number of machines, it frequently happened that the supply of a particular part was insufficient. The assembly would be started and then be put aside in its incomplete stage, and the customer's order would either be filled in part or deferred until the purchasing agent could procure or the foundry and machine shops could manufacture the required quantity of the needed part.

On the finished part stock shelves there may have been certain parts sufficient for the assembly of a hundred or more machines of one type and yet the foundry continued to produce those parts because production schedules were based upon bills of material. It is true that the office professed to keep records of the number of parts on hand; but so many parts proved defective or could not be found when wanted, and so many parts had been manufactured either in excess of or below the quantities called for in the production orders, that the office records were only approximately correct. They were useless in determining the exact number of machines of one type that could be assembled from the parts carried in stock.

The Need for Specialization

The condition of things described above illustrates the "guess-work" that passes for materials and stores control in

many factories and plants. The management thinks that the manufacture of so many parts or so many units of production will be about correct; it believes that such and such quantities of materials will be required to fill the needs of production; and it guesses that there is enough stock on hand of this, that, or the other product to fill the sales demands for quite a while. It is true that many organizations big enough to require a storesroom with a clerk in charge do put their houses in order to the extent of determining the minimum quantities of indispensable materials and supplies to be kept on hand—and in the majority of cases this is about as far as the control goes. Most factory executives are proverbially reluctant to allow specialization in any work unconnected with actual production. They look upon the large amount of detailed clerical work necessary to the control of materials as “unproductive” labor and therefore an expense, which ought to be reduced to the bare essentials required for the purchase and storage of materials.

In plants where this policy prevails it is not unusual for the department head who fails to maintain the schedule of production set for him to pass on the responsibility for the delay with the excuse that some essential material, or part, or supply, was not furnished in time. The department head probably blames the foreman, the foreman passes the blame to the shop clerk, the shop clerk places responsibility upon the purchasing department, the purchasing agent may blame the supplier, and the supplier, being outside the control of the factory, is perhaps after all the best person on whom to shoulder responsibility for production delays. The point is that the game of “passing the buck” is inherent in any system of management where responsibility for the performance of specific duties is not clearly and definitely fixed. To fix such responsibility it is obviously necessary to split up the work of materials control into as many functions as there are to be performed, and to

make some clerk, or division, or section, or department, responsible for the performances of each function.

The Nucleus of Control

The nucleus of the organization needed for materials control are departments responsible for (1) the purchase of materials, (2) their receiving, storage, and issuance, and (3) their movement within the plant. As will be explained in a later chapter, each of these departments may be expanded into a number of divisions and sections responsible for the performance of particular duties, the number being determined by the size of the organization and the variety and complexity of its products. Under simple conditions of manufacture the organization and mechanism will be correspondingly simple; whereas the manufacture of a varied line of articles made up from many parts will require an organization of many "unproductive" workers if the productive work is to progress with automatic regularity from the receipt of raw materials into stores to the dispatch of the finished products from the shipping room.

As the organization and functions of the purchasing department are, for reasons previously explained, left for later consideration, in the discussion of the organization needed for control we have only to consider the expansion or evolution of the storeskeeping department under varying conditions of manufacture. A bird's-eye view of the organization and duties of the personnel in charge of the work of control is necessary if the details to be described in Parts II, III, and IV are to be fitted into the general scheme.

Types of Manufacture

The varying needs of organization will be seen if we consider the control problems involved in different types of manufacture. Broadly speaking, all manufacture belongs to one of two types—"continuous" or "interrupted"—though both

types may be carried on side by side in the same plant. In the continuous type of manufacture production flows through the factory or the department, or a series of machines in a continuous stream. The problem of control is so to synchronize the materials, machines, and men that there will be no interruption to steady production. The finished goods are usually of one kind only. If the article manufactured is of a simple type, made in one piece, as in a glass works making plain standard-size bottles, or tumblers, or window glass, the organization for control purposes is relatively simple. If the article manufactured is complicated and made up of many parts and sub-assemblies, as in a bicycle factory or in a plant turning out but one or two types of automobiles, the control must be more elaborate and detailed. But in either case certain quantities of certain kinds of materials are required to produce a given quantity of goods; and as the goods are of one kind when once the routine between the purchase of the materials and the manufacture of the finished articles is standardized in all its details, the problem of control reduces itself to the maintenance of this standardized routine.

In a plant manufacturing a variety of articles, it is apparent that production cannot be as continuous as when the same machinery and workmen are constantly occupied with the manufacture of the same article, and that the interruptions of production caused by changes from the manufacture of one article to that of another increase the difficulty of control. Yet in principle the problems to be solved are the same under both types of manufacture. The difference is merely one of degree or number rather than of kind. If the principles and methods of controlling the production of one article throughout its manufacture are clearly understood, the control of a varied line of manufactures merely involves the finding of the proper detailed methods to fit the case and then subdividing the duties and responsibilities among a staff of clerical workers and

storeskeepers large enough to attend effectively and rapidly to the volume of detail created by the manufacture of such a complicated line.

As a rule it is not the highly organized industry manufacturing an intricate line—as for instance a concern making many types of electrical instruments—that objects to the “red tape” of control. In such a plant it would be impossible without such control to manufacture at a commercial price. Smoothness of operation and economy in the use of time depend upon materials and parts always being available when and where they are required, and the tendency to extravagance and waste is reduced to a minimum when an effective control is installed. It is the management of the small concern with a relatively simple production problem which thinks it a waste of time to draw up the records needed for effective control, and which tries to economize in the clerical work involved in maintaining a smoothly operating and efficient production program.

The Storeskeeping Department

Every manufacturing concern, big or little, which maintains a storeskeeping department, does so for three purposes: (1) to order, receive and care for the articles kept in stores; (2) to deliver them on suitable request or “requisition”; and (3) to keep a record of the values of the articles received and delivered and thus of the value of the inventories on hand.

Where the volume of work in the stores department is sufficient to keep one or more men fully occupied with the physical labor of handling materials and supplies, and of caring for the stock, the two distinct phases to the task of storeskeeping—the clerical and the physical—are for obvious reasons best kept distinct but under the same supervision. The qualifications demanded of the employees in the two groups differ accordingly. The group handling the clerical

work is the guiding force of the "materials control department" and one of its duties is to maintain the record of what the other group has done and should do. The other group—the storage group—whose work is largely physical keeps only such records as it needs to carry out its duties and keep a check on the records of the other group.

Administration of Materials Control Department

The materials control department occupies a position in the handling of materials similar to that of the personnel department in the management of men, or of the inspection department in the work of passing on the quality and perfection of the finished product. Like the heads of the last two departments, the head of the stores organization should be responsible to the chief of the production organization, because the success of this organization depends to a large extent upon their furnishing, when and as wanted, the materials required in production.

By placing the two groups in the stores department under one head, their work is correlated and each is made responsible for its part in the success of the whole. Co-operation can be obtained through friendly rivalry and mutual assistance in the difficulties which arise in ordinary routine work—and difficulties occur frequently enough.

In a small concern the one supervisor will have ample time and skill for administering both phases of his department. In the very large organization efficient administration requires that most of his time be given to the clerical group where the more frequent and more important problems arise. For directly supervising the storage group, he will have a specialist in storage problems as one of his chief assistants. When the work justifies it, the securing of another specialist as an assistant to supervise the clerical work is not a useless expenditure.

Functions of the Control Department

Though few concerns have hitherto recognized the importance of a proper stores or materials control organization, their number is steadily increasing as the fundamental importance of more systematic and controlled production is realized.

In addition to keeping the stores records relating to the receipt and issue of materials, parts, and supplies, the control department lays out and schedules production orders for the producing shops, and purchase orders for the purchasing department. As orders are based on sales probabilities and requirements, the preparation of the orders begins with the receipt and classification of sales orders. The control department translates these sales order requirements into shop terms and quantities, and is responsible for such planning and scheduling of production and purchase as will insure shipments to customers on the dates requested or specified.

In the manufacture of a wide range of assembled products, many production orders for the manufacture of parts and for their assembly into the completed product will be going through the shops at the same time. It is the primary function of the control department to keep track of these production orders, so as to insure the delivery of materials at the place and time they are required, and the return to the stores or finished stock room of the manufactured parts and completed articles. A secondary function of the department is to make the necessary entries on the stores records of the values of manufactured parts and finished goods as they are turned into stores after manufacture. Most of the clerical work involved in calculating these costs of manufacture is done in the cost department (see Chapter X). To the control department falls the task of keeping track of the movement of materials and parts, and of entering on the stores records the figures supplied by the cost department as to the value of the production, i.e., the finished parts and finished goods.

The Decentralization of the Storesrooms

The size of a plant will largely govern the methods of storing and issuing materials, parts, and supplies. Though all the inventories are under the control of the control department and this department is responsible for their movement to and fro within the plant, it does not follow that the inventories are stored in one general storesroom. Where the manufacturing departments are compact and the work is carried on in a small building, one storesroom centrally located may serve all storage purposes. Where manufacture is carried on on several floors, or where departments are located in different buildings, some decentralization of the storage department will be necessary though the control under all conditions remains centralized. The modern practice is to utilize as many sub-storesrooms as are necessary for convenience in manufacture, and to separate the stock rooms in which manufactured parts and finished goods are stored from the general storesroom in which raw materials and supplies are located. Nevertheless, however numerous the various storesrooms and whatever the classifications of materials, parts, finished stock, and supplies, one set of records controls the inventories as a whole.

It is apparent that material of a heavy or bulky nature, difficult to handle and not likely to be stolen or misused, need pass through the operation of being "taken into stores" only in a technical sense. Lumber may be conveniently stored under a shed outside the building, heavy castings may be taken direct from the foundry to the shop where they are to be machined, or finished parts may be taken direct to the assembly floor if they are immediately required for the work of assembling the finished product. But wherever stores are located, their whereabouts as well as their value should be entered on the stores records. Such records are assured when no work is undertaken in a plant without a numbered order of some kind initiating and directing this work, and when no materials, supplies,

and parts are used for any purpose whatsoever without a document (known as a requisition) specifying the number of the order, by which the nature of the work or the production to which the stores are to be applied can be ascertained.

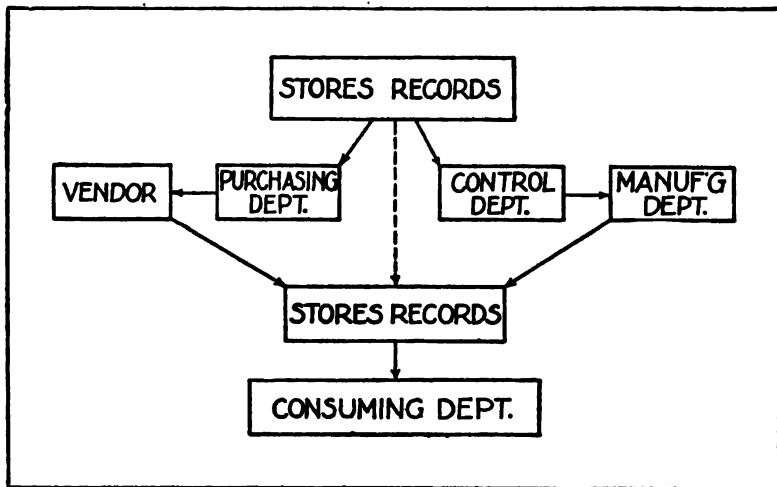
Relation of Purchase and Control Departments to the Plant

The relation of the purchasing and control departments to the other departments of the plant may be illustrated by considering the procedure involved in filling their requirements. The process of ordering begins with the determination of the need for materials or supplies. This need is made known by means of a requisition (to be illustrated later) upon stores for the article, materials, or supplies required. Materials and supplies are secured by purchase from outside; parts are usually manufactured within the plant, though under certain conditions or in some lines of manufacture, it may be better policy to purchase some of them ready made.

The requisition or inquiry for the thing wanted first comes to the clerk in charge of the controlling stores records. He ascertains from the records whether the article called for is in stock and if not whether it is to be purchased or manufactured. If the article has to be purchased the purchasing department is called upon to procure it; if it is to be manufactured the control department sets in motion the requisite order and accompanying papers to initiate its manufacture. Through either route the required article reaches the stores department and is entered on its records, thus completing a cycle that may be illustrated by the following diagram (Form I). X

Thus the control department is the agency through which pass all details of orders for articles to be made by the various departments of the plant. It receives the production order requirements from the clerk or the head of the division in charge of the stores records, plans the work, and schedules and routes it through the shops.

The purchasing department occupies a corresponding place in its relations to outside suppliers. It receives purchase requi-



Form I. Chart showing the Paralleling Procedures for Procuring Materials by Purchase and by Manufacture.

sitions from the clerk in charge of the stores records, places the order, sees that delivery is made on time, makes certain that the material received corresponds with the specifications in the order, and looks after the clerical work involved in checking the supplier's invoice and passing it for payment.

Other Service Departments—General and Cost Accounting

Having discussed the relation of the stores and control department to the work of production, brief consideration needs to be given to the points of contact between the control department and the other service departments which carry on the work initiated by the control department. In the following discussion it should be understood that reference is made to departments some of which may be operated only in large organizations where the need for specialization in duties and

for placing responsibility leads to their creation. Whether or not such departments actually exist, their functions are performed by somebody in every plant. The size of the business and the varieties of its activities will naturally determine the departmental division of its operations into specialized functions. Form 2 charts organization that has the usual control department.

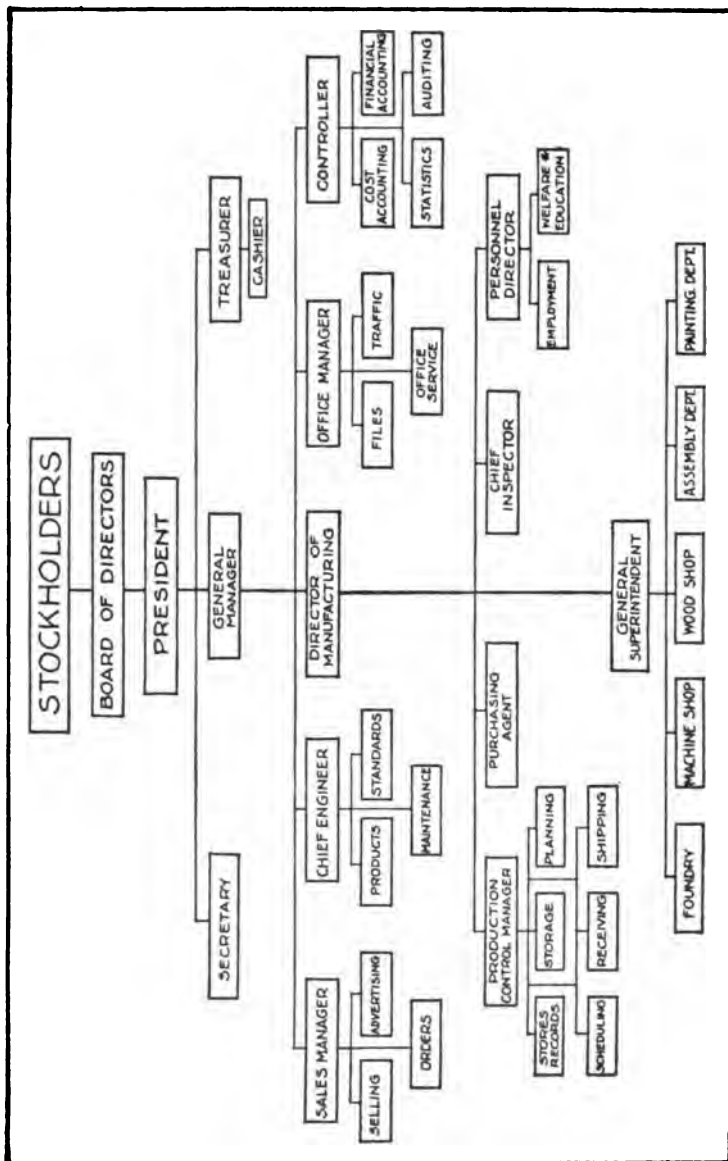
The line of demarcation between the work of the general accounting department and that of the control department can always be clearly drawn; that between the control and cost departments cannot be definitely determined. The conditions of manufacture govern in each case.

So far as concerns the purchasing and accounting for materials, the general accounting department should be responsible for recording liabilities and assets of the concern, and the amounts due to or from outsiders, and ~~for~~ accounting for all distributions to be made to the general accounts from purchase invoices. The work in connection with purchases begins when the purchasing department has approved a seller's invoice for material, and ends with the writing of the check for the amount due. In the sale of products the work of the general accounting department begins with the billing of the customer and ends with the crediting of the customer's account when the cashier receives a remittance.

To the auditing division of the accounting department, if such a division exists, falls the task of making certain that no mistakes have been made in the bookkeeping work.

In a large organization the control and cost departments have distinct duties and spheres of operation. In a small organization the functions of the two departments are occasionally merged under a control supervisor who is thus responsible for the correctness of the entries made on the stores records.

The cost accounting department, so far as the control of



Form 2. Organization Chart of a Large Plant Operated According to Modern Methods

This chart shows the relationship of the various departments and the authority and responsibility of the various officials.

materials is concerned, allocates the responsibility for all expenditures, receives stores requisitions after they have been priced and items have been issued, posts the values of these requisitions to the proper orders and accounts, distributes overhead expense to departments and burden to products, and prepares the statistical statements of costs and operations for the guidance of the management. Its work is described in detail in Chapter X.

Traffic Department

The traffic department's work involves the routing of incoming and outgoing shipments, and all other routine matters connected with the transportation of materials, especially purchased materials. The department is usually responsible to the office manager, whose duties will be explained later.

The Inspection Department

Where the nature of the production is such as to demand continuous inspection through the various stages of its manufacture, the creation of an inspection department is essential to centralize all responsibility for quality, size, etc., of items of stores received and issued. Thus the work of this department is complementary to that of the control department, and as such is concerned with ascertaining that the manufacturing departments or vendors supply exactly what they have been requested to furnish. The standards to be used as the *limits* in the inspection of materials, parts, and finished goods are determined in advance as nearly as possible. The engineering department, the laboratory, and any other department of the organization should be at the call of the inspection department when it is necessary to determine the suitability of questionable contract materials. All manufactured materials are inspected in the shop either after the article has been completed, or operation by operation as the engineering department con-

siders best. Purchased materials should be inspected immediately after their unpacking. This inspection is made preferably by the receiving department as agents of the inspection department.

When passed by the inspectors, all materials are turned over to the stores department for delivery to the consuming departments as wanted. The place occupied in the organization by each of these departments is shown on the organization chart (Form 2).

The Engineering Department

The primary function of an engineering department is to develop definite standards for quality and composition of the product of the concern and its methods and materials of manufacture. Such a department may require a laboratory with one or more chemists under its control, not only for purposes of experimenting with new materials and products, but also for testing both purchased materials and those manufactured in the plant when requested to do so by the inspection department. In this way the engineering department helps to determine how and wherein the manufacture of articles can be improved and whether the vendor has shipped what he contracted to supply.

The Office Manager

The office manager of the organization is the authority for the purchase of office supplies. He should have a technical knowledge of the materials used in office work and should standardize office supplies in the same way as the engineering department standardizes raw and manufactured materials.

A description of the functions of other departments besides those mentioned does not come within the scope of this book, which is concerned only with departments responsible for securing and handling materials.

PART II
PRINCIPLES OF CONTROL

CHAPTER III

THE RECORDS AND MECHANISM OF CONTROL

General Purposes of Control

A brief description of the essential records and the mechanism used in a system of materials control may best be begun by enumerating the main purposes of control and describing the means and procedure required to carry them out. The purposes of control are:

1. To keep the right quantity and qualities of materials on hand at all times.
2. To care for materials awaiting use.
3. To determine material requirements by correlating the production with the sales program.
4. To furnish cost figures of materials and supplies used in factory operations.
5. To furnish at any time statistics as to quantities on hand, on order, consumed, required, and so on.
6. To determine the value of the inventories for the purpose of preparing financial statements.

The survey to follow is merely explanatory of the mechanism used to carry out the above aims, a more detailed description of records and procedure being left for later consideration.

1. The Upkeep of the Inventories

The first of the functions of materials control enumerated above relates to the upkeep of the inventories. To carry out this function, three things must be determined and made a matter of record, viz.: (1) the quality or grade to be ordered, (2) the quantity to be kept on hand, and (3) the time needed for procurement.

The quality and grades of material to be used in manufacture are matters that every concern settles for itself. In very few lines of manufacture can materials be ordered on the basis of price alone without a careful comparison between the price asked and the quality supplied. In some lines the necessity of maintaining a standard of quality may require that the raw materials and the product be put to laboratory tests and that a research department be organized to investigate the causes of defects in quality and to suggest remedial measures. In the majority of cases, however, requirements as to quality are met by making a careful analysis of the kind of raw materials best adapted for a specific purpose and then reducing these requirements to exact specifications. These specifications are kept on file and used in the purchase of all materials that must fulfil certain requirements as to quality or size or both. The method of standardizing the items of stores and then drawing up specifications for use in their procurement are matters for later discussion.

The quantity of an item of stores to be kept on hand is determined first by manufacturing requirements in the present and near future, and secondly by past experience in the time needed to procure the materials by purchase or to manufacture the parts or articles required in the shops. In the most simple system of storeskeeping, records are kept, usually in the form of a card file, to show the quantity of each item of material and supplies in the storesroom and the minimum quantity to be kept on hand. Originated to serve the purpose of a perpetual inventory so that the quantities on hand and their values may be ascertained at any time without taking a physical inventory, the stores ledger record has been developed until it has become the most important single record concerned with production and purchasing. A description of the several forms this record may take and the many purposes it serves is the subject of Chapters IV to VI.

2. The Care of Materials

While the necessity of having a place for everything and keeping everything in its place would seem to be essential for the successful operation of any storeskeeping system, many attempts to control the inventories break down at the start because of inadequate facilities for storing and caring for materials. A manufacturer who never for a moment questions the wisdom of buying all the materials and supplies needed for purposes of manufacture, often fails to realize the necessity of a considerable investment in fixtures and equipment and the need for considerable floor space, if a heavy investment in stores is to be cared for and items are to be handled and counted with the minimum of lost motion and liability to error and with the maximum dispatch. For every cent saved in interest on the capital cost of the storesroom equipment, dollars may be lost through waste, oversight, and needless handling where the necessary fixtures, fittings, and weighing and counting machines are lacking. The arrangement and equipment of the storesroom and the method of stowing materials are thus details in the general plan of control sufficiently important to merit careful consideration and study. To the discussion of this matter two chapters are devoted in Part II.

3. Correlation of Production and Sales Program

To insure a regular turnover of the inventories and thus the minimum loss from dead stock and capital necessarily tied up in stores, it is essential for the production program to be based on a careful estimate of what the sales may be expected to be during the coming quarter, half-year, or year. The longer the period covered by the estimated sales budget, the better the provision that can be made to meet the production requirements. If, as is the practice in the management of many businesses, the estimate of future sales is based on hopes and expectations rather than upon careful calculation,

the production program will be liable to frequent change and it will be difficult to estimate material requirements for any length of time ahead. Under these conditions, either materials must be carried in stock in sufficient quantity to provide for all possible contingencies, with swollen and wasteful inventories as the consequence; or the attempt to keep the inventories as low as is compatible with the needs of production is likely to result in the disorganization of production routine because of lack of materials and supplies.

Proper materials control, therefore, begins not in the purchasing, but in the sales end of the business. It falls upon the sales department to furnish the production and control departments with estimates, on which these last departments can base their purchasing and production programs.

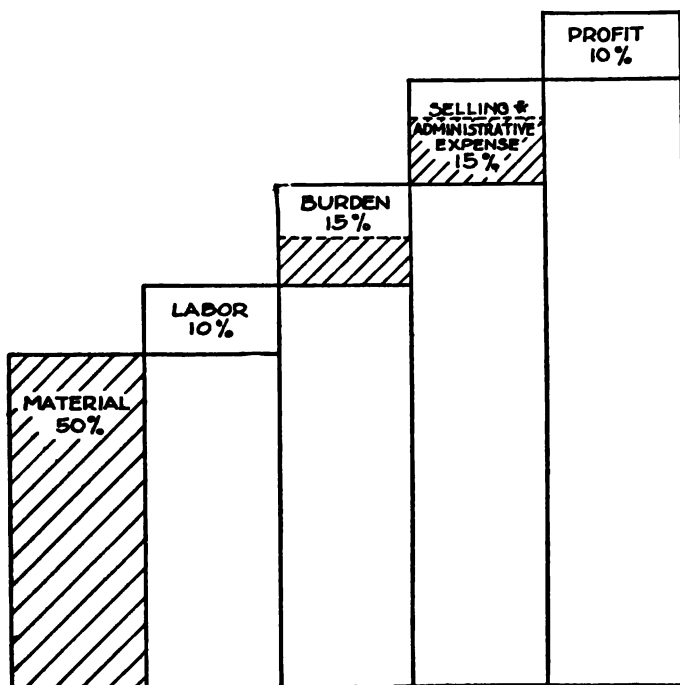
It is not intended to imply, by the emphasis placed on the importance of the sales estimate, that the sales department wholly determines the production program and therefore the quantity and kinds of materials to be purchased and carried in stores. A sales program must be trimmed to and attuned to the productive capacity of machines and departments and sometimes to the supplies of materials available or procurable. The point is that the sales manager, factory superintendent, and the head of the control organization must get together and map out the production program in its every detail, which detail goes back to the materials in the storesroom and the quantities that will have to be purchased to cover future requirements.

4. Materials as an Element of Cost

The profit of a manufacturing enterprise is the margin between what is received for the product and the cost of its production. Production costs are made up of materials, labor, and burden; that is, of the purchase price of the materials used and the wages paid in producing a certain article, or a number of parts, or a given lot of goods, and a proportion of

the general expenses incurred in operating the factory. The wages and materials costs are termed "direct costs" because they can be charged direct to the job or process; the overhead charges are known as "indirect costs" because they are charged to the job or process upon some indirect factor, such as the time spent in producing the article, lot, or parts.

A major item of cost in every plant is that of the materials consumed; in certain industries, especially those engaged in producing articles of every-day consumption, materials often



Form 3. Chart Showing Elements of Selling Price

Shaded portions represent influence of materials.

cost more than either labor or overhead. The above chart (Form 3) illustrates the elements of the cost of a product in which the material cost is assumed to be half the selling price.

It falls upon the stores and control departments to keep track of the materials issued for manufacture so that their consumption may be traced and allocated to the job or process on which they are used, and so that supplies may be charged to the department where they are consumed. The means of withdrawing items from stores and thus tracing and allocating their cost, is by surrendering a stores requisition specifying the kind and quantity of the particular item requisitioned and the purpose to which it is to be put.

A stores requisition is thus a written order on stores to deliver certain material for use the value of which is to be charged to a suitable account. The requisitions, after being priced, form the basis of credit to the stores inventory account and particular accounts controlled thereby, the offsetting charge being to Work in Process, Burden, or Expense. The accounting procedure, so far as it concerns the control of materials, will be fully discussed in later chapters. For the present it need merely be understood that material for one order or account only can appear on one requisition. The principle and practice are the same with all kinds of materials.

5. Statistical Feature of Stores Control

In modern factory management the tendency is more and more to control production by means of budgets and estimates of requirements, based on the future sales program and the ability of a concern to finance the estimated volume of production and sales. The economy of first preparing such estimates and then carrying out the buying, production, and sales programs according to plan should be apparent. In the chain of factory operations between the purchase of raw materials and the shipment of finished goods, expenditures are constantly being incurred and financial provision must be made for them before they arise. If the minimum amount of capital is to be tied up in the materials requisite for carrying on these opera-

tions, it is necessary for the management to receive frequent and regular statistical reports of the capital tied up in the inventories, of the values consumed in production, and of the financial obligations incurred in materials ordered but not yet delivered and taken up on the books. The form and content of these statistical reports vary with the nature of the product. In general, however, records are kept by the control department to show the movement of materials in and out of the stores department day by day, so that at the end of a given period the daily totals may be summarized to furnish the required statistical information.

6. Classification and Valuation of Inventories

We have seen that all materials, wherever located, are under the control of the stores organization, and that everything manufactured or purchased, after counting and valuation, is recorded on the stores ledger records until such time as it is drawn out for use on an order or for disposal in some other way. Thus, whatever material is represented in the stores accounts should also be in the custody of the stores department.

For purposes of control it is convenient to classify the material handled by the stores department into four groups, according to its intended use, as follows:

- (a) Raw materials and supplies stores, usually known as general stores. This classification includes all materials purchased from outside which have not been processed in the plant, and sometimes certain supplies made within the plant.
- (b) Component parts stores, sometimes known as "worked materials" stores. This includes all materials that have been partly or completely processed as a step in the completion of a finished or assembled product.
- (c) Finished product stores. This includes all completed products ready for shipment on sales orders.

- (d) By-product stores, sometimes known as "salvage" or "scrap" stores. This includes all obsolete or scrap materials or supplies no longer needed or unusable in production without reclamation.

The total value of whatever is in each class of stores is the inventory value of the financial controlling account for that class of stores. The account is charged with whatever is received, and is credited with whatever is delivered. When material is delivered for production, its value plus the value of the labor expended on it and a portion of the overhead expense, is charged to an order of some kind, the forms and content of which will be discussed later. The order while in process belongs financially to the inventory account known as "Work in Process," and this account is credited with the value of the finished parts of goods turned into stores. There is usually one work in process account for each stores inventory account.

The usual manufacturing cycle in a factory making a product in pieces or assembled from parts (and this means the majority of factories) is for raw material to be received into general stores, requisitioned out for work in process, turned into component parts stores, requisitioned out again for work in process, and finally turned into finished product stores where the completed article is ready for sale to customers. Part of the raw material may find its way into by-product stores as scrap.

The above classification of the stores and work in process accounts is sometimes modified by subdividing the accounts into two or more subsidiary accounts. This is done whenever the value of a particular material is large or when a closer control over the material is desired. For instance, a motor manufacturer divides his raw materials and supplies into four classifications: pig iron stores, steel stores, coal stores, and miscellaneous or general stores. A stove maker classifies his finished products and work in process as ranges or as stoves.

(a) **GENERAL STORES.** Every manufacturing concern transforms some kind of raw materials into parts or finished product, or both, and uses many kinds of supplies in processing the raw materials, such as belting or oil, and in addition various office supplies. These materials may be secured from outside concerns by means of purchase orders, or for reasons of economy or speed of delivery some supplies may be manufactured within the plant. However procured, these materials are passed into and held in general stores until such time as they are requisitioned out for use in connection with a production order, or in the current routine work of some department. Their value becomes a direct charge to either the department or to the order on which they are used.

(b) **COMPONENT PARTS STORES.** Materials are received into component parts stores under the conditions already outlined. They may be in any stage of completion, either in the usual form of fully processed parts and sub-assemblies, or of partly processed parts. Though they may be sold as parts for repairs or used in other ways by the sales department, the purpose of the processing is to make completed parts; and when complete as parts, to assemble them into completed units of finished product. Component parts may be purchased from outside or may be manufactured and assembled inside the plant. A material may become a part of component parts stores any number of times, but each time it will have advanced further toward the finished product stage.

(c) **FINISHED PRODUCT STORES.** Everything which has reached its final stage of manufacture and is ready for shipment to a customer is held in finished products stores which, as explained before, may be subdivided according to classes of products. It is the final place of account for products before delivery. The term "model" is usually applied to the article which has reached its final stage in production.

(d) **BY-PRODUCT STORES.** Scrap and obsolete materials

have a value that needs to be considered in the inventory accounts. Such material may be put into shape for sale, or it may be reconditioned for use. Accordingly, it is accounted for in the same way as any other material under a suitable heading such as "by-product stores."

Illustration of Procedure

The procedure and routine involved in stores control may be illustrated by a description of the manufacture of a simple article such as that of cartridges. Cartridges are made in many varieties, of which the one known as "22 short" is probably the most widely sold. They are usually manufactured in a large quantity, and the production problem resolves itself into balancing the number of machines so that the total production on all operations of all parts and assemblies is equal. Side by side with this *continuous* manufacture, another type of cartridge may be turned out under *interrupted* manufacture wherein the process is broken into many stages. A brief survey of the processes of manufacture is necessary to indicate the stores problems involved.

The first step in the production process is to punch a circular disk of metal from a brass sheet; then to draw the disk into a cup-shaped piece which is alternately annealed and fashioned in several operations into the form known as the "shell." After the shell is shaped and trimmed, a primer is inserted in the head of the shell. This primer is an assembly of a smaller shell, which has been similarly processed and then filled with a high explosive. The shell assembly is then almost filled with powder. After this operation an assembled bullet is wedged into it, and the cartridge is finished.

Machine breakdowns, absent operators, and bad materials are causes of trouble to the control organization. The use of various raw materials, the change in unit in the punching of cups from sheets, the need for the proper quantity of parts to

make up the assemblies, the management's desire for knowledge of costs—all these matters form stores and materials problems the solution of which falls upon the control organization.

In the example given above of cartridge manufacture, the sheet of brass from which disks are punched is the first step in the manufacture of the cartridge shell. The sheet has lost its identity and has been transformed into a number of small disks which can no longer be handled on the basis of weight, but have become individual units. It is necessary for the control department to know the quantity and the total and unit value of the cups processed, as a means of checking the efficiency of the machine, or of the brass-rolling mill, or for planning future production. This information is also wanted by the cost department, in order to check actual costs against estimated costs, and to record the value of the inventory in the accounts. If this information is to be available, the value of the material at whatever stage it has reached must be known.

If one size of brass cup can be used for various sizes of cartridge shell, it may be economical to make the cups in very large quantities, although the succeeding processes may be best handled in smaller lots. In such cases production is not continuous, but proceeds step by step until the finished product is turned out. Under any of these conditions the number and value of the cups made must be known, in order to control labor and production.

In the case of the manufacture of brass sheets for cartridges, copper, zinc, and other materials have been requisitioned from general stores, melted, cast, and rolled—and then turned into component parts stores in the form of sheets. When the sheets are later requisitioned from stores for use on a production order for processing cartridge shells, their value is charged to the Work in Process account. At whatever

stage the processing of the shells may stop, the material is turned into component parts stores as component parts and the Work in Process account is credited, while Component Parts Stores is charged with the value.

When a production order is issued for assembling the cartridge, the final product, shells are withdrawn on a requisition, with powder, bullets, and primers, for the manufacturing department. All items are charged to the proper production order, which is included in the Work in Process account. When the cartridge is completed it is turned into finished product stores, the Work in Process account being credited, and the Finished Product account debited. Thus from one stage to another a complete transfer on the control and financial records has been made, although the material may or may not have been moved through the storesroom each time.

Classification of Orders

Stores orders are of two kinds: purchase and manufacturing. Both originate from the stores records. Purchase orders are written by the purchasing department when ordering material from outside concerns. Manufacturing orders are written by the control department upon manufacturing departments. The effect of both kinds is to increase the value of the stores inventory accounts. The control department also handles and schedules two other kinds of orders—expense orders and plant increase orders, which originate not from the stores records but upon the request of such executives as have the authority. The nature of these orders is explained below. As all orders affect one, two, or all of the inventory accounts, their origin and use must be carefully noted.

Stores Orders

The two kinds of stores orders, purchase orders and manufacturing orders, are much alike, both being issued to secure

items of stores. A manufacturing order is placed for the manufacture, within the organization, of parts and products, while purchase orders calling for an exact quantity of a specified material to be delivered on a definite date are filled from an outside source.

Plant-Increase and Expense Orders

The other two classes of orders—expense and plant-increase—cause the withdrawal of material from stores, but do not permanently increase the net inventory total of any of these stores accounts through the turning of material into stores.

Plant-increase orders are issued for the installation of new equipment, for the manufacture of tools, or machines, or for the erection of buildings. Expenditures on such orders increase the permanent capital investment of the business. Their issuance must have executive approval and be provided for in the budget of the concern. When plant-increase orders are completed, the value of the production is charged to plant investment.

Expense orders, also known as “standing orders,” are issued for the replacement or repair of buildings, equipment, or tools. They are designed to authorize and set in motion all repair work—never new installations—and are usually requested by the department for which the work is to be done. The cost of the labor and the material used is charged direct to the departmental or general expense account covering the particular kind of expenditure incurred, and not to Work in Process. No increase in inventory or in plant results from such an order because no assets are being created.

Charging the Stores Accounts

When a manufacturing or a plant increase order is completed by the finishing of the work called for, it is closed out as detailed in later chapters. At that time the controlling

work in process account is credited and a stores account or a plant investment account is charged.

Stores accounts are also charged in another way. Any kind of material—raw material, supplies, component parts, or finished product—may be withdrawn from stores in excess of requirements and returned thereto. Since the material has been charged out for a specific purpose or order on which it cannot be used, the order should be credited with its value. To that end it must be returned to stores and the charge transferred to the stores account. This is explained in detail later.

CHAPTER IV

THE STORES RECORD FORM

Purposes of the Stores Record

The stores record or ledger is the essential record concerned with the control of materials; when fully developed it becomes the most important single record for regulating both production and purchasing. The ancestor of the modern record form is the perpetual or continuous inventory card, the need for which developed with the needs of storeskeeping and the necessity of knowing at any time the amount of each item of stores on hand without making a physical count or examination. Modern methods have so developed the possibilities of the original record that it is now used for purposes of production and accounting.

The stores organization must exercise the same control over materials which a bank considers necessary in the conduct of its business. Whatever material is in the storesrooms must be recorded and controlled financially and physically. Anything "withdrawn" from stores must be charged to the recipient and credited to the "bank," and whatever is received into the stores must be included in the inventory accounts and thus charged to the stores account and credited to the deliverer. Stocks on hand, whether purchased or manufactured, represent money and on occasion may be a very ready method of obtaining money. The record for materials, therefore, is as necessary as a ledger is for cash, and it is just as important to know the total value of materials on hand as to know the cash balance.

Information Furnished by Stores Record

Though the information recorded on the stores ledger, card, or sheet varies for obvious reasons with the conditions and requirements of manufacture, the essential data entered on the record in a complete system of materials control comprise:

1. A description of the material.
2. The factory requirements for each kind of material.
3. The quantities "on hand," "on order," and "allotted to production."
4. The quantity to be ordered when the time comes to procure a fresh supply either by production or purchase.
5. The unit price at which the particular item of stores is to be priced on requisitions.
6. The quantity consumed during given periods.
7. The value of the quantity on hand.

General Purposes of Information

The general purposes of this information have been summarized by J. P. Jordan ¹ as follows:

A standard stock record form takes into consideration *all* features. By this is meant that it is not sufficient to consider production control necessities alone, or either cost necessities, purchasing or any other individual requirement.

Likewise, *all kinds* of material should be considered; Raw Materials, Supply Stores, Finished Parts, Sub-assembled Parts, and Fully Finished Assembled Parts.

Thus the stores record enables production or purchasing so to be planned as to insure having material on hand exactly in the quantities wanted at any time; it enables the factory manager to meet the sales department's schedules of delivery; it furnishes the only practical method of eliminating errors or omissions in ordering and securing materials for stock; it helps to reduce to the lowest possible minimum the dead stock

¹ Service Bulletin of C. E. Knoeppel and Company, Inc.

which cannot be used for its original purpose; and it guards against the production or procurement of an excessive supply of a certain kind, thus avoiding the tying up of working capital, and needless expenditure for insurance, taxes, and storage space.

As an aid to purchasing, the stores record accumulates statistics as to the consumption of materials of every sort during the period covered by the life of the record; it records the departments or the purpose for which items have been used and the accounts to which they have been charged. When the purchasing agent wishes to know if it is opportune to enter into a contract for a large quantity of material, he has only to refer to the stores records for information concerning past consumption and estimates of future requirements and thus determine probable future needs.

As an aid to proper expense and financial control, it furnishes the exact cost of all material used for production and for expense, all material received into stock and on hand. Without these details, the inventory values for financial statements can be secured only by physical inventory.

Finally, as an aid to the head of the control department the stores record should indicate the orders to be filled, the quantities on order, and how their completion is to be scheduled.

Methods of Keeping the Record

There are two ways in which the record can be kept—by using loose-leaf books, or loose card files. The loose-leaf book is to be preferred in a highly developed system of control on account of the greater convenience in using sheets of a size large enough to permit the entry thereon of the necessary data. Cards of a large size are expensive in the first instance and awkward to handle. Under simple conditions of manufacture, however, a simple inventory record card may answer

all requirements, in which case they are to be preferred to sheets. Entries can be more easily made on cards of a manageable size than on small loose-leaf sheets which need to be clamped together.

Whether cards or sheets be used, the loose-leaf principle is essential for speed in handling, thus cutting down the cost of operating the record. Occasionally stock records are kept in bound books but this method is so inelastic for indexing that there is nothing to recommend it and there are many disadvantages in its use. Obviously the amount of space which the record of a particular item of stores may require for its entries during the life of the book cannot be accurately estimated to allow for the allotment of the proper number of consecutive pages to that item. Furthermore, new materials will be stocked from time to time and new sheets or record cards must be made out for them. New sheets cannot be slipped into the bound book in the alphabetical order of their descriptive title or symbol, but must be entered where space is available in the book. A cumbersome index is then needed for reference purposes. This disadvantage is alone sufficient to condemn the use of a bound record.

Development of Stores Record Form

The ruling of the record and the amount of information it may be designed to record are determined by the system of control in use. The study of its development from the simple to the relatively complex will furnish a clear understanding of the theory governing its operation.

The simplest type of stores record and the type still used in the many simple systems of stores control is the perpetual inventory card previously referred to. When any concern grows to a size big enough to require a special storage place for the materials and supplies used, with an employee to care for them and hand them out as required, an inventory must be

kept of the quantities used, on hand, and to be procured when wanted, if the material purchases are to be subject to any sort of systematic handling and control. Such a record is illustrated in Form 4.

UNIT		MATERIAL				
LOCATION		UNIT VALUE				
DATE	QUANTITY REC'D	QUANTITY DELVD.	BAL. ON HAND	VALUE ON HAND		REMARKS

Form 4. Simple Perpetual Inventory with Price and Value Spaces.
(Size 5 x 3.)

For each item of stores a card is made out describing in its heading the nature of the item, its location in the store-room, the unit of issue, and the unit price. The unit of issue, whether in pounds, dozens, feet, cubic measure, or in single articles, should be stated on the card, and stores should be issued only in units of the stated size—this for the purpose of insuring accuracy in pricing, a matter to be explained later. Below the heading of the card in the columns shown in the illustration are entered the date of each issue, the quantities of the item received and delivered, the balance on hand and its value.

Control of Ordering by "Maximum" and "Minimum" Quantities

In the use of the simple record illustrated above, the replenishment of stores is left to the judgment of the stores-

keeper, who must notify the purchasing department or the manufacturing department when a new supply is needed. This loose method of relying on judgment instead of experience as to when an item of stores and how much of it shall be ordered, can be avoided by determining the maximum and minimum quantities to be kept on hand, or, as sometimes termed, the "minimum ordering quantity" and "ordering point."

The minimum quantity is the smallest quantity desirable to be on hand unless an order is outstanding for a new supply. It should be sufficient to last until the new supply arrives; thus the ordering point is reached when the stock sinks to the minimum quantity. The maximum quantity is the largest quantity expedient to order at one time and desirable to have on hand. Under ideal conditions the quantity ordered should arrive at the time of the issue of the last unit of the old supply. Thus the maximum is the largest quantity which could be on hand.

As such an exact schedule cannot be maintained in practice, it is customary to increase the ideal minimum by a margin of safety. Thus, if the average consumption of an item is 100 units per week and it requires two weeks to obtain a new stock, the minimum would be the sum of 200 units plus the margin of safety—say of 100 units—or a total of 300 units. An order is placed when only 300 units remain in stock or are on order.

Keeping Track of Available Quantity

Almost as important as the designating of maximum and minimum quantities is the record for the storeskeeper's information, of the fact that a fresh supply is on order. Unless an entry to this effect is made on the record for ready reference, it is necessary to review the order files, otherwise mistakes are apt to occur either in failing to order when required or in duplicating a request. Columns for recording this data

regarding orders are therefore a desirable addition. They usually appear on the left side of the form. Form 5 shows

UNIT		MAXIMUM		MATERIAL				
LOCATION		MINIMUM		UNIT VALUE				
ON ORDER		DATE	QUANTITY		BALANCE ON HAND	VALUE ON HAND	REMARKS	
ORDER NO.	QUANTITY		RECEIVED	DELVD				

Form 5. Simple Stores Record Form with "Ordered" Columns. (Size 6 x 4.)

a stores record card designed to give this additional information. Since the time to order is indicated on the record itself, receipts must be offset against outstanding orders to show when an order is completed. Form 6 illustrates a record in which the data as to the quantities on order and received is shown in some detail.

The material on order plus the quantity on hand is known as the quantity "available" for requirements. The stock of a material is never considered as down to minimum so long as the quantity available is greater than the minimum point.

The columnar arrangement is illustrated in Form 7.

Co-ordinating Requirements and Schedules

If the only materials information required for production management is that covered by records of the quantities of

47

[illegible]

materials and supplies on hand and to be maintained, the forms so far described serve the purpose. The data shown on such records is all that is called for under simple conditions when production is determined by sales requirements as they arise. Where, however, production is planned ahead and carried out on schedule in accordance with an estimated sales program, it is necessary, in order to estimate the requirements for future production, to co-ordinate the three factors of labor, equipment, and materials.

Columns for recording "requirements" of each article are shown on Form 8. These figures may be estimates of sales or of production, actual shipping orders or other reliable and pertinent data. Such data will usually be expressed in terms of finished product, which must be translated into component parts and raw materials and then posted to those records.

These requirements are paired up with the quantity available—due "on order" and "on hand"—to make certain that the requirement is covered surely and safely in all respects by purchase or by production. If the requirement is not covered, an order for more material must be immediately written.

Appropriating Material

Occasionally, a still closer control over materials is needed. Requirement statistics are usually estimates made considerably prior to the time of actual need. When materials are used for a number of purposes, it may be of advantage "to reserve" or "to appropriate" the quantities needed for specific orders. These quantities must be more closely compared with those on hand and available than the requirements quantities, for the time of actual need is closer. The arrangement of the additional columns required is shown on Forms 7 and 8.

The detail of the stores system required by plants and industries varies. Some need a stock record containing all the preceding routine, while others will appropriate or reserve only

a few important or "key" materials. However large the sheet or complicated in appearance, the design must be arranged according to the needs.

"Ordering Quantity" and "Ordering Point"

In the modern stores record the terms of "maximum" and "minimum" have been superseded by the terms "ordering quantity" and "ordering point" as the latter more fully represent the actual procedure. The ordering quantity is the *smallest* quantity which ordinarily it is economical to procure either by purchase or manufacture at any one time. In setting the minimum figure for this ordering quantity, the length of time required to secure the new stock, the cost of beginning production, or the loss of the gains of large-scale purchase are matters taken into consideration. The upper limit of the quantity is governed by the costs of and convenience of storing the materials during the period it lies in the storeroom awaiting use.

The ordering point is the amount which ordinarily would be needed to meet average or somewhat more than average requirements during the time the new stock is being procured. A third quantity known as the "danger point" may also be usefully indicated. Unlike the other two terms which apply to the available quantity, this term applies to the quantity on hand and is the point at which inquiry should be made to see that the scheduled delivery time of whatever amount is on order is adhered to.

These quantities are shown in the heading of Form 7.

"Running Totals" versus "Balances"

The stock record forms so far shown have columns for entering the balance or quantity of an item remaining on hand after each withdrawal, and for this reason the record is sometimes referred to as the "stores balance sheets." The

practical use of such balance columns is open to question. The following is quoted from a service bulletin regarding this subject written by J. P. Jordan and sent to the staff of the C. E. Knoeppel and Company organization:

After many tests during actual operation of Stock Records, it was proved that the number of times a "Balance" was actually used in comparison *to the number of times it was computed* was very small.

By the same long series of experiments, it was found that the extra work necessary to answer questions from all sources such as from Purchasing, Production, Sales and other departments as to the *quantities used in given times* was enormous.

The reason for this was that by the "Balance" method, it was necessary each time to *add the entries* for the period desired in full detail. By the "Running Total" method, this or any figure is available by simply subtracting any two figures.

Furthermore, as to accuracy—addition is easy; it is therefore far more accurate than subtraction. By the "Running Total" method, the clerical work is *all addition*, except for the comparatively few times an actual balance is required. And most always, only a glance is required to *add* the new item entry to the running total, and likewise closely enough give the observation necessary as to "Balance."

"Balances" tell only a daily story of a "*Net Result*," while "Running Totals" tell at a glance the same story, and will also answer any and all questions instantly as to "*Quantity to Date*," or for a week, month, year, etc.

There is hardly an item but what the Stock Record clerks should watch as to length of time in stock, the speed or movement, etc.; and by doing this make the Stock Record a living and intensely useful instrument.

In few systems of materials control is it considered necessary to show on the stock record the balance of stores on hand. Form 8 is a standard form developed for the purpose of recording all information that can with advantage be entered on the stores ledger and on which no column is provided to show balances.

51

Form 8. Modern Stores Record with "Appropriated" and without Balance Columns. (Size 17 x 11.)

Heading of a Stock Record

Particular attention is called to the heading of Form 8 in which provision is made for:

1. A full description of the articles, with its symbol, size, type, etc.
2. The unit, unit weight, and the cubic space it occupies.
3. Its location in storage—the storesroom and the detailed location therein.
4. The source of supply, time required to obtain, and its composition.
5. Its use.
6. The controlling account in which its value is carried.
7. Consumption statistics during past periods.
8. Data of "ordering point" and "ordering quantity," expressed as "maximum" and "minimum," with the date such quantities were set.

While this completes the discussion of the fully developed record form, it should be noted that special cases may demand the addition of other information to that already described. For instance, in one case known to the writer it is required to know for purposes of control the exact location in the storesroom of every case of product. In another plant deliveries of all products are analyzed in three columns, headed "Consignment Sales," "Cash Sales," and "To Factory Expense." The purposes of such columns are evident and the necessity for their use can be provided for as required. By a study of conditions, it is possible to design special columns to fit any special need and occasion.

Opening a Stores Record

When it is decided to open a stores record, the first thing to do is to take an inventory of the stocks of all materials on hand. All items should be listed, standardized, classified, and symbolized according to their function as will be explained in detail in later chapters.

Every material, a stock of which is to be maintained in the general, the component parts, and the finished product stores, should be represented by a stores ledger card or sheet and should be a standard material. All other materials and supplies should be included in the by-product stores records. The unit cost price or value of the material should be secured from the cost department or purchasing department, or by estimate as may be necessary. After the details have been filled in, the records should be filed alphabetically by class and definition, or according to symbol, if it has been decided to symbolize the items. Then as soon as the "ordering point" and "ordering quantity" are decided upon, the record is ready to be put into operation.

The Handling of Various Classes of Materials

In a simple storeskeeping system the perpetual inventory record is only maintained for such raw materials and supplies as are purchased or manufactured for use in production, that is, in the shops. In a complete system of materials control it is advisable to include in the general stores classification those records relating to items used for other purposes beside production.

There need be no difference in the method of maintaining the records because of a difference in source or purpose of the materials or in their stage of processing into finished product. The same forms can be used, sheets can be indexed according to symbol or definition, balances and entries can be posted or recorded, and all the other transactions can be carried out in the same way. In Chapters XI and XVIII on the "Control of Inventory" and "Graphic Production Control," it will be shown that the same principles and methods are applied to the ordering or replenishment of component parts and finished product items as to the ordering of general stores.

Increasing Inventories

In factory operation it often becomes necessary to stock material which may have been previously specially ordered as occasion demanded or which has never been used at all. In Chapter XI, "Control of Inventory," it is shown that the stores records clerk is responsible for determining the quantity of stock to be kept on hand. Any department wishing to increase that quantity by the procurement of non-stocked material or by an increase in the ordering quantity of material already stocked, should furnish reasons for such requests in writing.

When ordering new material for stock it is necessary to ascertain whether or not the supply is to be renewed when exhausted. If the stock is to be replenished, careful deliberation and investigation are needed before approving its purchase or manufacture. The reason for this is that material already on hand can often be made to serve the purpose of the new material requested. No new item should be permanently included in the stores lists unless it is to be a standard item and stocks in the future are to be ordered without a detailed investigation of the purposes of their consumption. Materials the stocks of which are not to be replenished will, as a rule, soon be withdrawn from stores and the responsibility for their cost will be passed to the account receiving the benefit. The latter class of material is usually segregated in the stores ledger under the heading "Unclassified Stores," while the former is in the section devoted to the "classified" items.

To authorize the stores department to secure a stock of new stores, the stores record department should be given an "order to stock material" (Form 9) as the authority to secure the first stock of new material. The form here illustrated gives the description and definition of the material, the initial and probable future consumption, together with any other details which could aid in determining the proper ordering

point and ordering quantity, and any other data of aid in filling the order. The order, whenever the orderer is able to furnish them, should be accompanied by drawings or other

DATE _____		ORDER TO STOCK MATERIAL NO. _____			
TO MATERIALS CONTROL DEPT. : SECURE A STOCK OF THE FOLLOWING MATERIAL ACCORDING TO DIRECTIONS:					
MATERIAL UNIT	MATERIAL DESCRIPTION				
DETAILED SPECIFICATIONS OF MATERIAL					
REMARKS ON CONSUMPTION, STORAGE, ETC.					
DATE INITIAL SUPPLY WANTED	PROBABLE CONSUMPTION		APPROVED		
	INITIAL	FUTURE			
STANDARD DEFINITION AND UNIT ASSIGNED					
MATERIAL CHECKED	SYMBOL ASSIGNED	ORDERING		DANGER POINT	APPROVED
		POINT	QUANTITY		
<div style="text-align: right;">FORMS REQUIRED DEPT. 11</div>					

Form 9. Order to Stock Material. (Size 6 x 4.)

proper specifications. If these cannot be supplied, the stores records department should draw up the specifications by reference to another department or to any available information descriptive of their nature and physical properties.

Such an order should be signed by an authority in the use of this material, such as the head of the engineering department. The procurement of a new item of stores not only increases the inventory account and may involve a heavy expenditure, but when previous experience with the new material is lacking there is a chance that some or all of it may be wasted through the bad judgment of the ordering authority.

Upon receipt of an order to stock material, the stores records clerk checks the form, determines whether the material is to be manufactured or purchased, classifies and symbolizes

to write the charge or use upon the record in one place, thereby automatically reserving the incoming stock for that purpose. The uses of the remaining columns are the same as for the forms explained in the preceding discussion.

This record covers only material ordered for one specific purpose and whose stock is not to be replenished when exhausted. When the final issuance occurs, the balance on hand will become zero, the record of the material automatically becomes dead and is filed by the material symbol in the permanent dead file.

CHAPTER V

PRICING THE STORES RECORDS

Necessity of Accurate Prices

For the accurate control of materials it is essential that the unit value used on stores papers for pricing materials, parts, and supplies be accurate. To insure this accuracy careful attention needs to be given to two matters: the correct recording of the total and unit value of the goods received into stores; and care in the clerical work of entering prices on stores and cost documents and in extending the price figures.

The total and unit material values should appear on every stores record sheet—the total value to determine the unit value and for statistical purposes, the unit value to be used in pricing requisitions.

Though in many storeskeeping systems values are not shown on stock records, it is apparent that if a concern wishes to know accurate costs of their manufactures, and to draw up a monthly profit and loss statement, it cannot do so unless the value of the materials consumed is recorded.

Advantages of Pricing Stores Record

The arguments for carrying values on stores records are that the practice makes for accuracy and economy and is useful for control and statistical purposes.

It is the only way to price requisitions at the actual cost of the material used. When the price is secured from other records such as an invoice or cost sheet, the person pricing the requisition cannot be certain that the price applies to the material used. Each item of the inventory should be cleared

out and charged to requisitions at actual cost if the stores ledger accounts are to balance with the controlling account in the general ledger.

As every requisition is entered upon a stores record to show the delivery of material, if the price for costing purposes is secured from another record, a second clerical operation is necessary with an increased possibility of error. Thus for both accuracy and convenience sake the stores records should show the price of each item.

To secure all the benefits of the pricing of a perpetual inventory, the items of stores should be systematically counted or otherwise checked in order to verify the records periodically and avoid the necessity of a shut-down for inventory taking. The cycle of checking each section of the stores ledger, that is, every item in a section or classification, should be completed at least *once a year* for the purpose of verifying the agreement between the total of all balances in this section and the balance of the inventory control account on the general ledger (see Chapter III). When the cycle of checking the quantities has been completed, and the individual sheets show each item to have been verified, on a given date the balances on hand of all items are reckoned. These balances are priced and reckoned and the total value for the account is computed by means of an adding machine. If all invoices and cost sheets chargeable to stores have been entered on their detail records in the ledger and posted in total to the proper account in the general ledger, the figures of the control accounts and the sections of the stores ledger should agree. This agreement could not be obtained if values were not recorded on the stores records.

A final advantage of the pricing of the record is the possession of all available and useful information in one place, affording a complete fund of statistical information regarding the items of stores used. For instance, the inspection of the stores records shows at a glance such information as quantities

purchased and quantities used, speed of use, comparative prices of materials, comparative investments, size of issuances, obsolete material, and slow-moving material. The whole story is told in one place, with no other records to refer to.

Recording Values

In operating the stores records it is unnecessary to extend the amount or value of each issue in the "issued" columns. It is sufficient to record the price at which material has been issued, thus indicating the price entered on the requisition and the value of the withdrawal.

To enter this extension, the stores clerk must stop his posting to extend the amount or a second reference and posting must be made if the extension is made later.

The above observation does not apply, however, to the "received" columns in which the full amount should be entered. The value of the goods received should be determined at the time the new material becomes part of the existing stock, so that if there is any change in the unit price at which the requisitions are to be charged, the fact can be noted on the stores record.

To ascertain the unit price of purchased materials, reference must be made to the vendor's invoice, to which should be added any transportation bills, so as to determine the total cost of the material delivered to the storesroom. Until the invoice is checked for accuracy, purchased materials should not be formally taken into stores by entry upon the records. To ascertain the unit price of manufactured parts it is necessary to refer to the cost records supplied by the cost department.

The unit price of the manufactured parts taken into stores is ascertained from the "report on cost of manufactured material" (Form 11). This report is made out in the cost department as soon as the costing is completed, and is forwarded

to the stores records clerk for the entry of unit and total value on the stores ledger.

MATERIAL SYMBOL		REPORT ON COST OF MANUFACTURED MATERIAL				ORDER SYMBOL	
DESCRIPTION							
QUANTITY ORDERED		QUANTITY COMPLETED		TOTAL COST		UNIT	
REPORT BY	MADE UP DATE	ENTERED ON ORDER	ENTERED ON STORES RECORD	STORES CON- TROL CHARGED	IN PROCESS CON- TROL CREDITED		

Form 11. Report on Cost of Manufactured Material. (Size 5 x 3.)

Components of Material Costs

The components of the cost of manufactured materials—direct labor, material, and burden—and the method and compilation of the costs, are discussed in Chapter X on cost accounting. The cost of purchased material is the invoice price plus the inward transportation charges which are often incorrectly absorbed as burden. This is discussed in Chapter XXIV.

Some concerns attempt to distribute storage charges over the material stored, resulting in complex and cumbersome clerical effort. These should be included in general overhead, except where a storesroom serves one department when its expense is a part of that department's burden.

Materials are frequently received into the storesroom before the complete cost is known. Partial deliveries exaggerate this situation. The question soon arises, following such a receipt, as to whether that material should be entered on the record

and then issued before the cost is reckoned. If so, at what price should it be issued? A rigid rule that no material can be issued until the price has been secured, causes delays in production. On the other hand, no materials should be in the storesroom without having been charged to the stores inventory account. It is preferable to break the latter rule.

Two courses of action are open. The requisition may be held until the actual price is known or an estimated price may be used. If the requisition is held until the value is known, the accounting and clerical work is retarded and generally becomes quite confused. As the accounts involved by the particular requisition are related to others, a very desirable effect is produced.

The more satisfactory solution is to use the estimated cost price. The material being issued in advance of the reckoning of its cost, should be priced at the last known price or by an estimate, and stores credited and the account charged with that amount. Any error in the estimate must be adjusted to the account receiving the material.

Predetermining Costs of All Materials

This difficulty of obtaining promptly the price at which items are to be entered on stores records has led to the practice of predetermining the price figure before any material or manufactured parts are actually received. The department placing the order usually determines the estimated price and advises the stores records clerk by entering the estimated figure on the copy of the purchase or manufacturing order furnished to him.

When materials are purchased, it is a simple matter to determine the price if the purchasing agent asks for quotations before the purchase order is sent, especially if the material is purchased f.o.b. destination. The unit price is then readily determined after subtracting trade discounts. Later if the

price is changed, or if it is not known when the order is placed but is learned before the material is received, the purchasing department notifies the stores records clerk by sending him a copy of a supplementary purchase order showing the corrected price. Otherwise the price is estimated, as for manufactured materials, from records of past prices, estimates, the judgment of managers or buyers, or any other data considered reliable and recent. If sufficient investigation is made and the subject is treated as a matter requiring judgment, the price agreed upon will be so near to the actual as to make an adjustment on the stores records seldom worth while.

As noted, the use of any other than actual cost prices requires an adjustment to be made somewhere to maintain the financial accounts in balance. Frequently, two general ledger profits and loss accounts are set up—"Purchase Cost Adjustment" account, and "Manufacture Cost Adjustment" account. The accounts are charged with the actual costs, and credited with the estimated amounts at which the material has been charged to stores. The balances of the accounts are carried into profit and loss periodically. Should a large discrepancy arise between actual and estimated costs on any item, the difference, as before noted, may be individually adjusted on the requisition or stores records to absorb part or all the difference. With careful estimating, the total debits and credits for a period should balance approximately.

In estimating the price of items it is well to err on the safe side and intentionally to create a credit balance, especially when the above accounts are first opened. The results of the first few months' operation will reveal the mistakes in pricing and future estimates can be more accurately made.

This procedure is desirable in many businesses but not in all. It should be installed only after thorough study of the requirements and possibilities of meeting them by the actual cost method.

Methods of Pricing Requisitions

There are two much debated methods for pricing requisitions withdrawing materials from stores: to use the actual price of each lot of material so long as any of that lot is on hand; or to use the average price of two or more differently priced lots.

In many plants both methods are used for pricing because the application should differ: (1) according to the costs it is desired to obtain, and (2) according to the material.

Regardless of the method of pricing, it is apparent that the total material costs of the business as a whole for the year will be substantially the same; but for each cost period and for each individual job during the year the material costs will be somewhat different under the various methods.

Actual Costs versus Standard Costs

The method to be adopted depends upon whether the business should have: (1) actual costs, or (2) standard costs.

Actual costs require that a requisition be priced with the actual price of material issued. Thus, since the oldest material is issued first, the price used is the oldest. This results in considerable fluctuation in costs from period to period, or between similar orders, particularly when market or other conditions are causing considerable or abnormal fluctuation in prices.

Actual costs are said to be more desirable because they are real costs and therefore show real profits. Their disadvantage is that when production costs are compared with other periods or with selling prices, the difference reflects the fluctuation in the actual material costs. Selling prices based on actual costs are sometimes too high to obtain business or too low to make a profit under average conditions.

Standard Costs

Because standard costs are not actual costs, does not mean that they are inaccurate. Such costs are intended to

reflect the cost of manufacture under normal or average conditions, and are especially desirable in businesses manufacturing a staple or standard article. Cycles of higher and lower prices are soon reflected in higher or lower costs even with standard costs. Interpretation of cost statements with the possibility of increasing the profit or the necessity of paring the profit, is easily made from the knowledge of general business conditions.

Standard costs furnish a more equable comparison of results between periods, between different plants and different systems of management. For this reason the trend seems to be toward standard costs as evidenced by the movement among various trade associations, such as the Foundrymen's and the Typographers' Associations, for uniform and standard methods of cost accounting. By such means the executive is able to compare his costs with the costs of other firms in the same trade, thereby deducing whether his organization is as efficient as his competitor's and whether he will be able to meet competition profitably or not.

The real ability of his organization is shown by the ability of each function to make good in its own activities, that is, whether his purchasing department is able to make money by contracts at opportune times, whether his control department is able to accomplish the maximum with the smallest amount of inventory and of overhead expense, and whether his foremen receive a proper quantitative production from the employees under their direction. Determining the ability of various functions to accomplish their purpose is illustrated below in the amount of profits in purchases as shown by pricing requisitions at current prices.

Actual Cost Methods of Pricing Requisitions

All materials purchased or manufactured especially for a certain order, should be priced at actual cost. In special order manufacture a large part of the materials used may be specially

secured, in which case to ascertain the profit or loss it is necessary to cost the materials at actual price. In fact, to use the actual cost for pricing all materials other than staples is the best practice.

Where a staple of one general kind is in stock but varies slightly in quality, the actual price should be used. For instance, a clothing manufacturer has various lots of linings, all of the same general grade but varying a little in price. He receives an order on which the cost must be favorable. A lining of that grade but of the lowest price is selected for the order. The requisition for the lot actually used should be priced with that lot's cost.

Frequently staples are priced by using the oldest price recorded on the stores record regardless of how many different prices there are. The arithmetic of the method is illustrated below :

Receipts				Deliveries			
Jan. 4	500 units at \$.50....	\$250		Jan. 18	300 units at \$.50....	\$150	
Feb. 15	100 " " .70....	70		Feb. 20	200 " " .50....	100	
" 18	200 " " .60....	120			100 " " .70....	70	
				" 23	50 " " .60....	30	
				Balance	150 " " .60....	90	

As material is issued, the 50-cent price of the first receipt is used in pricing requisitions so long as any of the 500 units received at that price remain in stock. The requisition of February 20 calls for 300 units; it is filled by 200 units at \$.50 (the balance of the first receipt of 500) and 100 units at \$.70 received on February 15.

This method of using the oldest price until the quantity covered by the price is exhausted, conforms with the policy of giving out the oldest stock first to prevent, if possible, any deterioration from age, obsolescence, or other cause.

Actual prices thus reflect actual costs and in turn actual profits—and not current or average conditions and cost.

Average Cost Method for Pricing Requisitions

An average unit cost for pricing requisitions may under certain conditions be the best in the case of staple raw materials, standard component parts, and finished products. The method involves more calculation than the actual price method, and hence is more open to error. The figuring of the average price involves its recalculation every time any material is received, as illustrated below:

Receipt	Jan. 4	500 units at \$.50.....	\$250
Delivery	" 18	300 " "	.50.....	150
Balance		200 " "	.50.....	100
Receipt	Feb. 15	100 " "	.70.....	70
Balance		300 " "	.566.....	170
Delivery	Feb. 20	300 " "	.566.....	170

As material is received, the quantity and total value is added to balances of quantity and value on hand, and a new average unit price is calculated. If the new material costs more than the old, the value of the old material is written up and that of the new material is written down, as shown above.

Average prices tend toward giving standard or average costs whose advantages have been described in previous pages.

Pricing Requisitions at Current Prices

Materials, while always priced out at cost, are not always used in costing at cost prices. Certain industries accumulate the speculative profits on purchases where the number of major raw materials is not great. The practice is included as a part of the standard cost systems of several trade associations.

The practice as applied to the iron and steel industry is illustrated as follows:

Pig iron receipts for charging to stores at the contract price per ton. When requisitioned the iron is credited to stores at its contract price, and charged to a "Pig Iron Adjustment" account; at the same time the requisition is priced with

the current *market* price of pig iron, and the adjustment account is credited with the amount. If the adjustment account shows a credit balance, this represents a profit due to the higher market price as compared with the contract price; if the account shows a debit balance, there is a corresponding loss.

The advantages of this procedure are threefold: (1) it furnishes a more standard or uniform cost, and it conforms with the principle of basing costs upon current market conditions; (2) it reflects the efficiency of the purchasing department in forecasting the trend of the market and in buying under favorable conditions; (3) it segregates a profit and loss variable for independent judgment.

Inventory Adjustments

In every storesroom some materials and parts become obsolete or deteriorate in quality before being used or prove unfit for the purpose for which they were secured. This deteriorated material clogs the inventory accounts when allowed to remain in stores. It should be disposed of and charged off to "Loss from Deterioration of Materials" account as soon as possible, so that the inventory accounts may reflect the true value of the stock and represent actual working capital.

Despite every care mistakes are bound to be made from time to time in the amount of material given out by storeskeepers; or materials may waste away from evaporation or may be lost through pilfering or theft. Discrepancies in consequence are revealed when actual count is made and the count is compared with the quantity called for by the stores record. Some storeskeepers write up the unit value of the material on hand to cover sufficiently the cost of the shortage. This practice is to be discouraged as its effect is to hide the loss or shelter the party responsible for the safekeeping of stores. Such discrepancies when discovered should be charged off to a "Loss in

Inventory Adjustment" account. If the charges to this account indicate that the discrepancies are more than should occur in the routine of receiving and withdrawing stores, an investigation should follow.

CHAPTER VI

OPERATING THE STORES RECORDS

Reporting Delivery of Materials to Stores

In previous chapters reference has been made to the delivery of materials and manufactured parts into stores. Such deliveries are reported to the control department and entered on the stores records through the medium of material received reports (Forms 48 and 82, pages 231, 386, 387). It is possible to use one form to report the receipt of both raw material purchases and manufactured parts, but as the forms may be made to serve supplementary purposes, it is recommended that separate reports be used.

A purchased material received report should show:

1. The number of the purchase order to which the material applies.
2. From whom received.
3. The date received.
4. The symbol and description of the material.
5. The quantity received, rejected, and accepted.
6. The storesroom to which the accepted material has been sent.
7. The signature of the inspector.
8. Any other data of interest to the department receiving the reports.

The routine of receiving purchases is described in Part IV where Form 82 (pages 386 and 387) illustrates the report made out by the receiving department upon receiving any material from a vendor on a purchase order. Here it is sufficient to explain that one copy of the report is forwarded to the control department and is posted to the record in the same way as the

"manufactured material received report" to be discussed below.

Form 48 (page 231) is a "manufactured material received report." As described in Part III, the record is used as a route card covering a batch or lot of the material throughout its process of manufacture into finished parts. When the parts are received in stores, the card is forwarded to the control department where the two kinds of received reports are treated alike. That is, the quantity received is entered in the "received" section of the proper stores ledger card or sheet after which the reports are forwarded to the cost department.

The total and unit value of the material must be secured as soon as possible after receipt, as requisitions must be priced as soon as material is issued. The cost of manufactured materials is reported by the cost department on Form 11 (page 61), while purchased materials cost is secured from the purchase invoices.

The Stores Requisition

Material is issued from stores as required, upon presentation of a stores requisition (Form 12), which like a check drawn upon a bank, is an order for the delivery of the amount of stores designated thereon. The information on any requisition should include:

1. The symbol of the account to which the value of the material is to be charged upon issuance. This symbol denotes whether it is to be charged to a departmental expense account or to a production order.
2. The quantity of material desired and its unit.
3. The symbol and description of the material wanted.
4. The department and its location or the production unit to which delivery is to be made.
5. The time when delivery is to be made.
6. The approving signature of a duly authorized party and the date of approval.

Form 12 is the ordinary type of stores requisition. While this provides for the ordering of only one kind of article, there are occasions when it is convenient to order several items of

STORES SYMBOL		HOLD FOR MATERIAL ON ORDER NO.		CHARGE ACCOUNT	
STORES REQUISITION					
DATE REQUIRED		DELIVER TO		LOCATION	
WANTED		ORDER ONLY ONE ITEM ON EACH REQUISITION			
QUANTITY	UNIT	DESCRIPTION			
				DELIVERED	
				AMOUNT	UNIT
				PRICE	UNIT
				P E R DELIVERY	
				TOTAL VALUE	
WRITTEN BY		APPROVED BY		DATE	
DATE		DATE		APPROVED	
NOTICE TO REQUISITIONER: USE ONLY SPACE BETWEEN HEAVY LINES					
APPORTIONED		LOCATION IN STORES		ISSUED	
BY	DATE			BY	DATE
				DEDUCTED FROM	
				TAG	RECORD
				EXTENDED/CHECKED	
				STORES CREDITED	
				ACCOUNT CHARGED	

Form 12. Stores Requisition, such as used in a very detailed system.
(Size 6 x 4.)

the same type or kind on the same requisition, as illustrated by the stores requisition copy of a shipping order (Form 13) and by Form 49 (page 232). More than one *class* of material should never be ordered on the same requisition.

The first and most important feature of the requisition is its charge symbol, designating the account to which the materials or supplies should be charged. The cost department, when making up expense and burden statements and production cost statements, checks these charges, and the party who has signed the requisition should be held responsible for authorizing the charge to the account designated thereon.

The second feature of the requisition is the quantity and unit of quantity. There is little likelihood of the quantity

SHIP TO		STORES REQUISITION				NO. 3694	
		COPY OF SHIPPING ORDER		CUSTOMER'S ORDER NO.			
CHARGE TO		F. O. B.		TERMS		SHIPPING DATE	
		ROUTING					
REMARKS							
LOCATION IN STORES ROOM	QUANTITY & UNIT	MATERIAL SYMBOL	MATERIAL DESCRIPTION	UNIT VALUE	EXTENSION		
APPROVED BY		MATERIAL RECEIVED BY		TOTAL VALUE			
APPROPRIATIONED BY		ISSUED BY		DATE			
DEDUCTED FROM TAG BY		DEDUCTED FROM STORES RECORD BY		EXTENDED			
DEPARTMENT		SHIPPING DIVISION		CHECKED			
DISTRIBUTION		DISTRIBUTION		DISTRIBUTION			

Form 13. Stores Requisition (copy of shipping order). (Size 11 x 8½.)

being omitted, but the unit is a detail often overlooked. A requisition may be received reading: "5-Midvale High Speed Steel 1" round" and the party ordering the items wants five feet; but if this material is bought by the pound and the stores clerk issues it in terms of pounds, the requisitioner will not receive what he wants. The unit of issue should be stated when possible to avoid the necessity of the storeskeepers having to translate the quantity ordered from one unit of measurement into another. The persons who ordinarily write the requisitions should be acquainted with the common units of each class of material.

The description of the material and its symbol are necessary information for locating readily the proper stores record sheet and the material itself. Particular attention should be paid to the accuracy of these two items as an incorrect or insufficient symbol may result in a misunderstanding as to the material desired by the requisitioner or in an incorrect entry on the stores ledger. When the storeskeeper receives requisitions calling for "3 screw-drivers such as we got last month," "500 sheets of paper," or "2 lbs. of nails," unless he is a telepathic mind-reader, he cannot be sure of the requisitioner's requirements. The description, therefore, should be complete. The symbol is both the index to the stores ledger and a safeguard against any misunderstanding as to the kind of material wanted. It is a commonly recognized means of identifying material.

In a factory of any size the requisition should not only designate the particular department or the production unit to which the material is to be delivered, but also the exact location within the department. Definite instructions of this kind save confusion in delivery and the time of the requisitioner when material is not on hand when wanted. Often the stores department is blamed for not supplying the material ordered, when it really has delivered it but at an unknown place.

In a large organization where the control department is responsible for the delivery of materials and parts to departments and machines as wanted, the time should be stated on the requisition so that the storeskeepers may plan their work ahead. The stores department should be given the longest time possible to deliver the material which is of course delivered at the convenience of the storeskeepers subject to the requisitioner's schedule.

Each requisition should be countersigned by the proper authority before it is accepted. The stores records clerk should have a file of the signatures of those authorized to approve requisitions and of the accounts they are authorized to charge. The right of signing requisitions should be delegated by the general manager or by each department head. No requisition should be honored as an order on stores until properly approved.

Routing the Stores Requisitions

Every stores requisition for material or parts of any kind, chargeable to a production order should originate in the production control department. When the requisition is made out, the quantity of material needed should be reserved as described in Chapter IV, if that is to be done, following which the requisition can be sent to the storesroom.

Miscellaneous requisitions not originating in the control department, amounts for which are not to be appropriated, are sent direct to the storeskeeper where they are immediately checked. Requisitions for supplies chargeable to expense are usually filled by immediate delivery.

Handling the Requisition in the Storesroom

If a requisition is not correct in form it should not be filled, but with a slip explaining the cause of non-delivery as shown in Form 14, it should be returned to the originator for

correction. A teller in a bank before he pays a check, carefully scrutinizes the signature of the drawer and the indorser,

TO _____		DATE _____
<p>The attached requisition is returned for correction. The items checked are either omitted, incomplete or incorrect.</p>		
	CHARGE SYMBOL	
	MATERIAL SYMBOL	
	MATERIAL DESCRIPTION	
	MATERIAL NOT STANDARD	
	QUANTITY OF MATERIAL WANTED	
	UNIT OF MATERIAL WANTED	
	PLACE OF DELIVERY	
	DELIVERY DATE	
	SIGNATURE OF APPROVING AUTHORITY	
<p>When corrected, the requisition will be honored.</p> <p>_____</p> <p>STORES RECORDS CLERK</p>		

Form 14. Slip to Accompany Requisition Returned for Correction. (Size 4 x 6.)

the date, the amount, and its other features. A storeskeeper should do the same with the stores requisitions.

If materials are for the particular use of one or two departments, or if they are of exceptional value, it may be desirable to maintain a strict control over their use. Certain limits should then be set on the quantity to be requisitioned at one time. The same remarks apply to the use of supplies

which because of their relatively low cost may be carelessly handled and wasted. For instance, a shop may order for a month's requirements 100 pounds of waste when 10 pounds may suffice. Any restrictions on issues should be noted on the ledger card or sheet as well as on the bin tag to be explained later, and when necessary, the requisitions should be modified accordingly.

When requisitions are not to be filled immediately, they should be filed in a tickler file under the date when delivery is required. If delivery is considerably in the future and the items wanted have yet to be delivered to stores it is sometimes advisable to tickle the date about one week or so before the expected receipt of the items, to make sure that the material

DATE _____
TO _____
THE FOLLOWING MATERIAL: SYMBOL _____
DESCRIPTION _____
ORDERED BY YOU FOR DELIVERY ON _____ IS NOT IN STOCK.
IT IS COVERED BY ORDER NO. _____ :
DELIVERY IS EXPECTED _____ . YOU WILL BE NOTIFIED
OF ANY CHANGE IN EXPECTED DELIVERY DATE.
_____ STORES RECORDS DEPARTMENT

Form 15. Notice that Material Is Not on Hand. (Size 6 x 4.)

will be on hand when wanted. In a large organization filling many hundreds of requisitions daily, the material should be made ready for delivery to the shops on the day before delivery is required, as described in Chapter XIV.

When a requisition is received for material not on hand—but which is on order—Form 15 is used to advise the requisitioner of the fact. The wording on this form is self-explanatory.

Posting Requisitions

When the material has been issued the storesroom forwards the requisition to the control department where it is first sorted according to symbol number, for posting to the records. After the quantity issued is entered in the "delivered" column of the stores ledger card or sheet, the requisition is priced, the necessary extensions are made, and the charges are ready for distribution to the account designated on the requisition. If stores symbols are not such as designate the stores inventory account to be credited the clerk should enter on the requisition the symbol of the control account to be credited.

The Stores Return

The return to the storesroom of any unused material charged to a certain account should always be accompanied by a stores return (Form 16, or Form 50, page 232), stating the account or order to be credited. When the storeskeeper has accepted the material and placed it in its proper bin, the stores return or credit is sent to the control department. The return is then priced, extended, and distributed in a similar way to a requisition but on the opposite side of the accounts originally debited and credited. Care should be taken to see that the credit price is the same as was charged when the material was issued.

Issuing by Specification

In certain industries materials or supplies of a certain kind are often used on all products or processes, as for example

in the printing trade where ink is employed on every job in the pressroom, and in the furniture industry where glue is used on almost every article made. In the majority of factories the common practice is to handle such materials as supplies

STORES SYMBOL		ALL EXCESS MATERIAL MUST BE RETURNED TO STORESROOM ACCOMPANIED BY THIS FORM.				CREDIT ACCOUNT			
STORES RETURN									
DATE SENT		SENT FROM		LOCATION		ACCEPTED			
QUANTITY		UNIT		REMARK ONLY ONE ITEM ON EACH RETURN DESCRIPTION		AMOUNT		UNIT	
						PRICE		UNIT	
						P E R OF DELIVERY			
						TOTAL VALUE			
WRITTEN BY		DATE		APPROVED BY		DATE		MATERIAL RECEIVED BY OR MOVE TAG NO.	
NOTICE TO WRITER : USE ONLY SPACE BETWEEN HEAVY LINES									
INSPECTED BY		DATE		LOCATION IN STORES		RECEIVED BY		DATE	
						ADDED TO TAG RECORD		EXTENDED CHECKED	
								STORES CHARGED	
								ACCOUNT CREDITED	

Form 16. Stores Return. (Size 6 x 4.)

and to deliver them on requisition as wanted, chargeable to burden. When this practice is permitted, the only check on waste is an unusual and excessive consumption sufficient to attract the attention of the management. A better method of control is to determine by experiment the approximate quantity of glue or ink needed for each job or process or each day's output, and to cover this quantity by a "stores requisition" issued and handled in the usual way except that the operating department keeps the reserve supply at all times and that the requisition does not pass through the storesroom. The control department thus has some check on the consumption of the material or supply used.

Standard Parts Lists Record

As previously explained, a bill of material similar to the "standard parts lists record" (Form 44, page 228), is often used instead of a requisition to withdraw materials or manufactured parts from stores. Where goods are made for stock, the bill of material or the standard parts record when once made up is a permanent record of the materials or parts required in the production of a particular order. If more material is needed than is designated on the bill of material, the extra material can of course be requisitioned according to the need.

The Order Requisition

When the ordering point is reached for the replenishment of an item of stores, either a "purchase order requisition" (Form 57, page 287), or a "production order requisition" (Form 17) is made out; at the same time, the requisition number and the quantity ordered are entered on the proper stores ledger record in the "ordered" columns. One form could be used for both ordering purposes, but as by elaborating the base of each form it is impossible to make it serve a secondary purpose in the control department or the purchasing department, it is recommended that distinct forms be used.

As it is stated on each stores ledger record whether the item is procured by manufacture or purchase, reference to the ledger indicates the kind of order requisition required. Each order requisition should state the stores symbol, describe the material, give its location in the storesroom, the material's specification number, the purpose of placing the order, the quantity and unit desired, the time wanted, and the account to be charged. It is desirable, although not necessary, also to state the "ordering point" and the "ordering quantity" for classified stores. This information is for the department pro-

curing the material in case conditions indicate that a change in the ordering quantity might be advisable.

Order requisitions should be made out in duplicate. The second copy is retained by the stores records clerk, and the

TO CONTROL DEPARTMENT		PRODUCTION ORDER REQUISITION NO. 3471			
		DATE WRITTEN _____			
PLEASE SECURE THE FOLLOWING MATERIAL BY					
QUANTITY	UNIT	STORES SYMBOL AND LOCATION	SPECIFICATION NO.	TO BE USED FOR	
TITLE AND DESCRIPTION OF MATERIAL					
REQUISITIONED BY _____		WRITTEN BY _____		APPROVED BY _____	
OR ORDERING QUANTITY	ORDERING POINT	STORES RECORDS CLERK		CONTROL DEPT.	
ACCEPTED - IF WRITTEN OUTSIDE OF CONTROL DEPT.	PRODUCTION ANALYSIS RECORDS PREPARED OR CHECKED	REQUISITIONER HAS NOTIFIED THAT MATERIAL CANNOT BE DELIVERED UNTIL	DATE	PRODUCTION ORDER	
DATE	APPROVED BY	BY _____	NUMBER	ON DEPT.	APPROVED BY
NOTES:					

Form 17. Production Order Requisition. (Size 8½ x 5½.)

first copy after approval by the department head is forwarded to the production or purchasing department, as the class of order requisitioned may be. The unclassified stores record sheet (Form 10, page 56) serves as copy two for all unclassified orders.

The preliminary work preparatory to placing the order is begun at once by the department receiving the order requisition. After the writing of the order, one copy is sent to the stores records clerk for his information and the noting of its order number on the record.

Periodically, at least once each week, the stores records clerk should review the records, glancing at the balances and their relation to the "ordering point" and the "danger point."

In a large organization much may happen between the date of placing an order and the scheduled date for receipt of the material. If the danger point is reached, Form 18 should be

NOTICE TO THE _____ DEPARTMENT				
THE SUPPLY ON HAND OF THE FOLLOWING MATERIAL: SYMBOL _____				
DESCRIPTION _____				
HAS FALLEN TO THE DANGER POINT WHICH WILL LAST _____ DAYS				
THE FOLLOWING ORDERS ARE OUTSTANDING				
ORDER DATE	ORDER SYMBOL	QUANTITY DUE	PREVIOUSLY SCHEDULED DELIVERY DATE	NEW SCHEDULE FOR DELIVERY
PLEASE LOOK UP IMMEDIATELY AND FILL IN THE EXPECTED DELIVERY DATE				
<div style="text-align: right;">_____ STORES RECORDS CLERK</div>				
ADDITIONAL REPORT				
<div style="text-align: right;">_____ SCHEDULING CLERK</div>				

Form 18. Notice of "Danger Point." (Size 6 x 4.)

used. Particularly is this likely to happen when materials are not all ordered at certain times strictly in accordance with estimated requirements.

Mechanical Posting of Records

Though there are several types of calculating machines on the market, the mechanical method has little advantage over hand-work for the keeping of stock records, except that work can be done more neatly and possibly more accurately by machine. So far no machine has been devised which can do the work connected with entries on a highly developed stores ledger any quicker than by hand.

sheet in the group. Such a division of the stores ledger account into groups is also valuable for statistical purposes.

Errors of the Storesroom

To check the balance of the quantity on hand as shown by the stores records with the actual quantity in the storesroom requires a physical count of the latter. The keeping of a tag on each bin in the storesroom for recording the stock in that bin furnishes one method of checks, as described in Chapter XIV. When a tag is filled with entries and the bin has been inventoried or when a lot is exhausted, the tag is sent to the stores record to be checked with its entries and discrepancies traced. Of course the bin tag may be wrong. Entries of deliveries may be made on it in error or may have been omitted, or a requisition covering an issue may have been lost, or mistakes may have been made in the count of quantities issued.

Mistakes in descriptions and units of materials cause discrepancies, or inaccuracies may result from the issuing of wrong materials and units. Again, one record may be properly made but the other may be wrong. This last error can be largely avoided by the use of proper symbols and standard descriptions, so that the material is defined to both parties in the same terms. Any error must then be due to carelessness. It is possible to check such errors by looking up the corresponding requisitions in the cost department filed by the charge account symbols.

Mistakes are frequently made in the quantity of material delivered on requisition. Particularly is this true of items issued in large quantities by weight or by count. Automatic scales for counting by weight may be out of adjustment, the use of "tote boxes" holding specific quantities may lead to slight inaccuracies, or a physical count may be incorrect and there is no method of check after the material has left the storesroom.

Again, employees may confuse stocks of two materials merely because they appear alike, resulting in the delivery of the wrong thing or in the mixing of stocks. This may happen particularly when goods after delivery to a requisitioner are returned unused and without a proper return form filled out (Form 16).

A good method of making certain that the stores record is accurate and so prevent the purchase or manufacture of ma-

REQUEST FOR COUNT OF STOCK					
MATERIAL			UNIT		
REQUESTED BY		QUANTITY	COUNTED DATE	BY	ENTERED STORES RECORDS
DATE					
REMARKS					

Form 20. Request for Count of Stock. (Size 5 x 3)

terial when not wanted, is to have the stock on hand inventoried, whenever an order requisition is written. Form 20 is used to request such a count. The storesroom report, when checked with the quantity which the record shows as being on hand, gives greater assurance that the material is actually required.

All discrepancies not adjusted by correcting original entries, should be adjusted by writing off the difference to a Stores Inventory Adjustment account. If the record is checked with an actual inventory from time to time, the balance will be corrected periodically and it will be approximately correct at all times. Errors can only be eliminated by careful work.

CHAPTER VII

CLASSIFICATION AND SYMBOLIZATION

Business Classification

Factory buildings may be classified as power houses, machine shops, and foundries. Men are classified as engineers, draftsmen, managers, bankers, machinists, etc., on the basis of the kind of work they do. Materials are classified as raw materials, supplies, component parts, or finished products, on the basis of their use in the business. Accounts are classified according to their use and the nature of the transactions recorded in the account—that is, into expense accounts, inventory accounts, cash accounts, etc.

In these few examples it is seen that the classification is according to use; that is, on a functional basis. These general classes are then subdivided into smaller groups to secure still further the control desired over the records. When the group classification has proceeded as far as seems necessary, we then identify the separate material, man, or activity within each classification or division. An employee's name is his usual method of identification though in business he may be given a number. Such a number is merely a distinguishing mark to make it easier to keep the records of his service.

Every business recognizes the need for classification and for some method of indicating that classification by the use of identification marks. A manager may first classify his orders into purchase orders or sales orders, then number each class serially and distinguish one class from the other by prefixing an initial P or S before the number as an identification mark. The departments of a business may be numbered or identified

by letters. The materials may be numbered from 1 to 10,000. Some systems of classification and an abbreviated system for indicating it, are found in every business.

Advantage of a Uniform System

Though classification is the basis of all systems and records, there is not always a definite and intelligently directed effort on the part of the management to correlate the various classifications and methods of identification into a single unified system. To illustrate, in a large organization material may be given number 1394; an order of a series may bear this number, and an employee be allotted this number. When 1394 appears what is meant? But if the system were properly devised, each person or object or order would be distinctly identified, with no danger of confusion.

Symbols at times "just happen" and are originated as the need arises, or as the person using them thinks best. Hence haphazard methods of classification and identification come into existence and continue to exist. The result is that only those who devise and use the symbols understand the marks of the various groupings or the history of their origin. Confusion and misunderstanding are the result.

Planning a Classification System

In any comprehensive system of classification, the groupings of the activities of the business must be carefully planned. The first question to be asked is, What groupings will be of most practical use in this business? It is useless to classify in great detail a large number of products, materials, processes, and activities unless the classification will result in saving time and clerical work. The maintenance of the classification costs money, and the returns secured from it must justify the cost.

To classify the activities of a business, it is first necessary to see where the results of a business are finally expressed.

These records are usually in the accounting books. All the records, no matter for what purpose maintained, either affect or bear some relation to the figures entered in the financial accounts. The records of all materials, machines, employees, etc., are all summarized in various accounts that make up the final book of account—the general ledger. Accordingly, then, the system of classification should be based on the accounts kept in the general ledger.

The First Steps in Classification

After it has been decided what general groups of things are to be classified, the first step is to make a complete list of all products, materials, men, and machines according to their main classification, and then further classify them into sub-classes. Probably the primary classifications or groupings will have been previously made on a fairly accurate basis—such as the grouping of materials as supplies, component parts, and finished product. Subsidiary classifications and records may also be already in existence, such as inventory lists and operation lists, and these groupings will be adhered to. In devising the classification scheme, lists or groupings already in existence should be compared with the new system of classification to make sure that nothing has been omitted. Having grouped all items under their proper classification, each item is given a distinctive symbol and such description as will distinguish it from every other item in the list. This is important, for confusion will result if one symbol or description represents two or more different items. Finally all items should be so symbolized that each has its proper and only place in its own group.

It is not to be expected that the system of classification will be functional throughout. Common sense must govern. In general the basic and most important classifications may be based on the various financial accounts in the general ledger.

Within these primary classifications, subdivisions may be marked off on the functional basis and the smallest groups may be based on the physical nature of the objects.

Within each group the basis of further classification has to be decided anew. For instance a group of articles may be used only in making a particular part of a machine product. This group may be classified on a functional basis, that is, on the basis of the use to which the whole group is to be put. But within the group the articles might be listed, not by the uses which they served in making up that particular product, but by the materials of which they are composed, wood, iron, brass, etc.

Thus the first step is to list by classes, divided into groups, and each group arranged in order so that every product or material which the business uses or has on hand is included within the group of its classification. The next step is to delete from the list all items which cannot be considered as an article of standard use. Standardization is considered in detail in Chapter XII. The point here to note is that the classification list should include every product, material, account, etc., to be used or maintained in the future.

Symbolization

It is a little known fact that names are not sufficient for the definite identification of one thing among many similar things unless the description is long and detailed. This will be evident to anyone who tries to identify adequately the various small items that form a part of his desk furniture. Without a detailed description, names are ambiguous and may mean two, three, or a dozen different things. An accurate method of providing an identification mark which will make the name definite and intelligible is the method of symbolization.

A name is of course a symbol of an object, but in the narrower sense a symbol is defined as a concise representation

of a name and a description. While any mark that can be rapidly made will fit the definition of a symbol, in practice symbols are made of letters or numbers or both. Symbolization proceeds hand in hand with the final classification. By symbolization all the elements in the classification can be permanently identified and maintained in their order for record keeping.

The symbol of an object should be so devised that it can be recognized without constant reference to a code. Thus if S is the symbol for supplies, C for service departments, S for shipping, and B material used for binding packages, then SCS₁B means string used by shipping department for binding packages and the symbol may be readily memorized if it is remembered that each character suggests its own meaning.

Use of Symbols Facilitates Clerical Work

Symbols, in addition to being an aid to ready identification, facilitate the routine of clerical work. When everything has been symbolized, the various records can be arranged in alphabetical or numerical order by merely referring to the symbols. Thus almost every paper on which a symbol is written is already indexed and can be immediately filed by that symbol. Stores record sheets are filed by material symbols; orders, by the order symbols; machinery record cards, by machinery symbols; while inventory accounts, expense accounts, and cost accounts are arranged in the order of their symbols for these classes. It thus becomes a simple matter to interpret each symbol as it occurs, as a glance tells the whole story. Mistakes are readily noticed, for a symbol that represents an impossible combination of letters is easily detected and corrected.

Use of Symbols Maintains Standards

Symbols are also of aid in the maintenance of standards. If the purchasing department, for instance, is authorized to

purchase according to a definite specification a certain grade of paper, it is immaterial, so long as the paper bought meets the specification of its physical qualities, whether it is purchased from one concern or another, or what is its brand. Employees, however, when they handle this paper and see a different name applied to it by its manufacturer, a different term of color, or a different method of packing from what had been used on the paper previously in stock, often are confused, and fail to recognize that it is the same kind of paper under a different name or under a description differing from the standard description. If, then, it be identified by symbol rather than by name, the employee at once knows that it is not different in quality and intended use from the previous lot. Confusion cannot result, standards will not be lowered. Non-standard material cannot be included in the standard list and items received will be properly described.

To make the symbols permanent and to prevent their degeneration through clerical errors or unauthorized change, their determination should be entrusted to the person who has charge of methods and systems. As each new standard material or other object is chosen, a new symbol is allotted to it so as to classify it in its proper group and to identify it in the records of the organization.

Numerical and Alphabetical Systems

There are two basic kinds of symbol systems : numerical and alphabetical. The first is usually built up like the decimal system devised by Dewey for use in indexing libraries. The second is based on the letters of the alphabet and is to be preferred to the numerical for the reasons already discussed. The ideal system, however, is neither a purely numerical nor alphabetical system, but a combination of the two.

Whatever the system, the requirements of a symbol are that it be brief, unique, and suggestive. The development of the

individual symbol, like the development of the classification system, should not be carried beyond the point of utility and the saving of clerical labor.

Brevity in the matter of symbols is easily attained, for any symbol is certain to be more brief than the name for which it stands. But brevity alone in a symbol is not sufficient, as it must not be too short and simple to be efficient. In the use of the numerical system we are limited to ten basic classifications, unless the symbol is complicated by the use of dots and dashes, for the separation of items. This use of signs should be avoided as the chance of errors in copying and reading symbols is too great. The alphabetical system gives us twenty-three characters for classes—I, O, and Q are not used because of their similarity to numerals.

Requirements of Symbols

Each symbol must be such that there will be no other symbol like it. Each item must be represented by one symbol, and one symbol must represent only one thing. This quality of distinction is a matter of mechanics in drafting the symbol system.

Another requirement is that of suggestiveness, that is, the symbol should bear some obvious relation to the words it stands for. Thus S readily suggests supplies or sales, and C can be seen to bear some relation to service. This quality is sometimes called "mnemonic." Therefore the use of letters as symbols is generally known as the "mnemonic" system. This consideration is a strong argument in favor of the alphabetical as against the numerical system.

Not all advantages, however, belong to the mnemonic symbols. Many large concerns use numerical symbols because of their adaptation to the requirements of mechanical tabulating equipment in the compilation of managerial data. This equipment is designed to accommodate a maximum of ten symbols in

any position, and all symbols in a given position must belong to the same class. As it is impossible to develop a practical mnemonic symbolization suitable for use with this equipment, many concerns now using or which expect to use this equipment do not use mnemonic symbols in their installations.

In the following chapter the mixed system is discussed and its advantages explained. Its study will enable the reader to devise a strictly numerical system suitable for use on mechanical tabulating equipment.

CHAPTER VIII

CLASSIFICATION AND SYMBOLIZATION OF MATERIALS

Problem of Classification

In a small organization the work of classifying and symbolizing the stores items is a relatively simple matter compared with the problems involved in the classification of the inventories of a large organization. The underlying principles are, however, the same. Closely related to the principles explained in this chapter are the matters discussed in the chapters on "Standards and Specifications" (Chapter XII) and "Control of Inventory" (Chapter XI). Before stores can be classified and symbolized they must be standardized and their nature specified; and before the inventory can be controlled it is necessary to determine the classifications of the stores ledger and other inventory accounts for the purpose of opening the necessary controlling accounts in the general ledger. Though the discussion of the function and operation of controlling accounts relates more to accounting proper than to the specialized accounting involved in materials control, a brief description is here given of the general purpose of control accounts.

Function of Control Accounts

In the accounting for a business of any size, it is customary to use the general ledger only for the purpose of showing the totals of the various kinds of assets, liabilities, expenses, and income, and to carry the detail of these totals in subsidiary ledgers. A subsidiary ledger is thus a section removed from the

general ledger and controlled by one account therein. As many subsidiary ledgers may be opened as there are groups or classes of assets, liabilities, etc. For instance, the stores ledger may be controlled in the general ledger by the four accounts, General Stores, Component Parts- Stores, Finished Product Stores, and By-Product Stores, necessitating the corresponding division or classification of the accounts in the stores ledger.

The entries to the stores control accounts are made in total at the end of each accounting period. The debits to the accounts controlling purchased materials are taken from the purchase or voucher register where the vendors' invoices are entered. The same invoices are posted on the subsidiary stores ledger on receipt of the goods. The debit entries to the manufactured parts and finished goods control accounts are made in total at the end of each accounting period by summarizing the cost records to be explained in this and later chapters. The detail of these records is entered in the subsidiary stores ledger as parts, and finished goods are delivered to stores. Practically all the credits to these accounts are taken from the summaries of requisitions which have withdrawn materials from stores.

Thus the summarized account is termed the controlling account, or the "control," because by watching the balance in that one account in the general ledger it is possible to control the total of the individual accounts in the subsidiary ledger. An increase or decrease can be watched to see that the total individual balances do not exceed a given sum or ratio. Thus, if the Component Parts account in the general ledger is considered to show an excessive investment, the individual accounts in the supporting stores ledger would be investigated and the necessary steps taken to reduce the stock of parts carried.

Classification of Accounts

In discussing the principles of classification and symbolization it is useful, for purposes of simplicity, to take a specific

example from actual business practice. To this end, the system of classification used in a printing house engaged in the manufacture of books and periodicals and in doing job work is explained in following sections.

It has already been stated that the base of every classification system should be built up from the accounts. The nature of these accounts and why they are divided into expense, assets, sales, and liability accounts, and how they are handled, is described in detail in the next chapter.

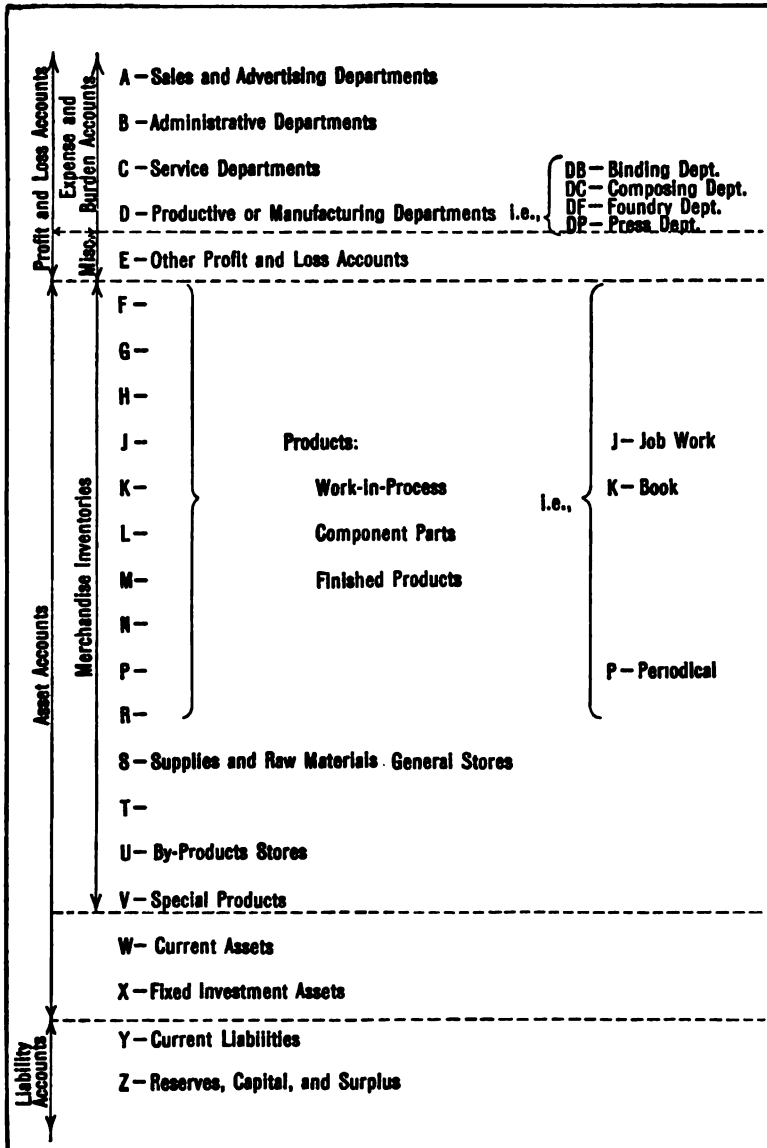
When preparing to symbolize a classified list it will be well to provide a number of sheets of standard letter-size paper with the twenty-three letters of the alphabet usable as symbols, printed in a single column along the left margin. These sheets will be very useful in tabulating in an orderly way the allotment of letters to classifications, and checking what letters are as yet unassigned.

In the system of stores symbolization to be here described, the letters of the alphabet are used to symbolize the main classification, while numerals are used to denote sizes or other characteristics impossible to represent effectively by letters. As the whole classification is based on the accounts, these are the first to be symbolized.

Reference to Form 21 shows the letters of the alphabet allotted to the different classes of accounts. The meaning and general purpose of this classification will become clear as the explanation is developed.

Classification of General Stores

In the business under consideration supplies and materials are carried in general stores in great variety. There are advertising supplies, such as circulars and folders; office supplies, such as writing ink, letter paper, and forms; supplies used by service departments, such as shipping materials, wrapping materials and fuel; miscellaneous supplies used by the



Form 21. Chart Showing Classification and Symbolization of Main Accounts

production departments, such as type metal, etc.; tools for production work, such as quoins, chases, and tweezers; building equipment and supplies, such as belting and electrical supplies used either for replacing worn-out equipment previously installed or for new installations. In addition there are many kinds of raw materials, such as paper stock in different tints and weights for the different kinds of products, as well as binding materials and ink. Ink is of such a wide use that it cannot be distinctly identified with the production of any one class of product, and is classed among the miscellaneous production materials.

Symbolization of General Stores

To each one of these classifications of general stores a symbol is given. On referring to Form 21 it is seen that the letter "S" is the symbol for supplies and raw materials, and the letter "D" represents the productive departments. Thus the meaning of the symbol SD is supplies used in a productive department. Similarly S followed by other letters of the alphabet indicate the nature and thus the use of other supplies or materials. For instance:

- SA - Supplies used in sales and advertising departments
- SB - Office supplies used in administrative departments
- SC - Service departments' supplies
- SD - Productive departments' supplies (not raw materials)
- SJ - Raw materials for job work only
- SK - " " " books only
- SP - " " " periodicals only
- SR - " " " production of more than one kind of product
- ST - Tools
- SV - Miscellaneous material not elsewhere classified
- SW - Building equipment

In the same way a subclassification is made of the various items of general stores falling in each of these main classes.

Thus the raw materials used for SJ, SK, SP, and SR, (see above) consist of binding materials, inks, and stock. The letter B readily designates binding materials, N represents ink, and S symbolizes paper stock. Binding materials include cordage, glue, cloth, etc. Printing ink is classified according to the color—black (K), blue (B), green (G). Stock includes, card stock (C), blotting paper (L), manilas (M), books (K), ledgers (L), bonds (B), covers (V).

The classification of the jobbing stock is carried further, the physical properties of the material largely governing the classification. Bond papers vary according to the finish—regular finish (R), cote finish (C), etc. In each of these there are several grades—which, omitting the trade names as they are meaningless, are numbered—grade 1, grade 2, grade 3, etc. Each variety of colored paper is distinguished by a letter—white (W), blue (B), green (G), straw (S), canary (C), brown (R). To designate the size of the paper, numbers are used such as 22"×34" indicating area, and 60# indicating the weight in pounds of a ream of a certain size. Thus understanding the meaning of these letters and numbers, every kind of paper used in the production of the company's product can be given a distinctive description and symbol. The method of constructing the symbol requires brief consideration.

Two Rules for Symbolization

In the construction of the combined alphabetical and numerical system of symbols here described, two rules are observed: (1) The size of the material is usually expressed in numerals following the second letter of the classification. (2) The items in the last subdivision are always listed in the order of their importance or grade and numbered serially. The serial number is placed before the last letter of the symbol. Thus a complete general stores material symbol always appears as two letters followed by one or a series of numerals denoting size, more

letters to designate the kind of material, a numeral to designate the grade, and a final letter designating a physical characteristic.

To simplify the construction and recognition of symbols, letters and numerals should always refer to the same classification when in the same position. Thus in the symbols SJ22x34x40SKR1B and SK22x34x40SKR1B, the characters SKR1B always mean paper stock, book, regular finish, grade 1, blue; while the size, weight, and use are expressed by the first group of symbols. The two papers to the uninitiated may look exactly alike but there is some difference between them as indicated in their symbols. As illustrated above, the first symbol refers to paper stock to be used on job work, and the second symbol designates stock to be used on book work.

Classification and Symbolization of Service Department Supplies

The same principles and methods are used to classify and symbolize all other materials in stores. To illustrate further the methods as applied to general stores, let us classify the SC group, (service departments' supplies) before passing to the product symbols. Referring to the departmental symbol chart, it is seen that the service departments are assigned the base symbol C. To each department a separate symbol is allotted: CS - Shipping Department, CH - Heat and Power Department, CJ - Janitor Department, CR - Maintenance Department. The materials these departments consume in their daily work are symbolized thus:

SCJ - Supplies used by janitor's department
SCH - " " " the power and heat department
SCR - " " " repair department
SCS - " " " the shipping department
SCV - Miscellaneous supplies used by all the service departments

The shipping department makes use of binding, wrapping,

SYMBOLIZATION OF MATERIALS 101

and packing materials and containers. Binding materials include string, cord, rope, and gummed paper tape. How extensive must this classification be? If the subdivision just made is sufficient to give each item a distinctive description, the listing and numbering of kinds can be made at once—string is 1, cord 2, etc. To illustrate the complete classification and symbolization:

- SCS1B - String used by the shipping dept. for binding packages
- 2B - Cord " " " " " " " "
- 3B - Rope " " " " " " " "
- 4B - Gummed paper tape used by the shipping department
for binding packages

Were it desirable to subdivide the classification further, so as to distinguish a variety of colors of string or a number of kinds of rope, etc., a separate letter would be given to each kind of material and the detailed division would be carried as far as it might be convenient to list and number the physical characteristic of an item. If items are carried in several sizes; it should be noted that the numerals to designate size would be placed after the second letter.

Similar methods of symbolization can be applied to any kind of material or supply it is desirable to control. If for instance the stock of fuel were of such importance that a close watch was required over its value it would be removed from the general classification of SCH and symbolized by a suitable letter from the basic classification of Form 21. There are several available for the purpose, F preferably for its mnemonic value:

- SF - Fuel used for heat and power
- SFC - Coals
- SFL - Oil

The remaining articles in the SCH classification would remain in the same position. An inventory account would then

be opened on the ledger and symbolized with the letters SF. Invoices would be charged to this account, requisitions for fuel would be credited to this symbol, and in this way all documents, papers, and charges relating to fuel could be readily classified and its inventory and use controlled.

Symbolization of Unclassified Materials

So far the classification system has covered only the standard articles in daily use and which accordingly are kept in stock. For obvious reasons, not all supplies and raw materials to be consumed in the ordinary conduct of the business can be provided for. The secretary may need a rubber stamp with his name upon it, or the press department may need a part to repair a press. The demand for such articles is special and probably would never occur again. Since the articles to be procured are not to be reordered on the maximum and minimum plan, no provision will be made in the permanent classifications and symbols. However, in the business under discussion it is found necessary to symbolize special articles temporarily in stores and later to be used for production orders, as fine leather specially procured for covering a special copy of some book. The symbols for special materials are made up by reserving the base symbol SS for this particular classification of purchases, while the individual articles are identified by listing them in their chronological order and assigning a serial number to each. The number placed between the two S's of the base symbol identifies the individual item.

This division of all articles into two groups—one group of those items assigned a permanent place in the classification and symbolization, and the other group of those items roughly thrown into a miscellaneous classification SS—has led to the application of two terms to the groups: classified materials and unclassified materials. In other words, these terms are used to represent materials stocked and not stocked.

Classification and Symbolization of Products

There remains to be considered the classification and symbolization of the products of the concern. These naturally fall into three classes: miscellaneous job work, books, and periodicals. There is one difficulty in this classification of product not met with in the classification of general stores. The articles made tend to vary considerably from one period to another, resembling in this respect the unclassified general stores.

The first task is to reserve one of the product letters for each of the classes of products made. J is suggestive of job work, K of book, and P of periodical. The principles of classifying products and the methods by which they are applied, are exactly the same as those used for classifying general stores. The K classification may be taken as representative of the three classes.

All books made are listed and the completed items cut out. Since the examples are taken from a printing house doing special order manufacturing work to meet their customers' demands and not for stock, the standardization work as applied to their product is simple—there is none.

The question, "On what basis should product be classified?" at once brings up many answers—grade, nature of subject, etc. Grade in this case is largely confined to one edition; the manufacturer is not interested at any time in the nature of the subject or its contents, though the customer is. Where the latter classifies the books he orders, he probably would use that as the basis of his classification. The manufacturer needs control as well as identification as a result of the classification, and the thing of first importance is the control of each customer's account. It is therefore advisable to divide them into classes according to customers: the Red Press Company (R), The Fisher Co. (E) and so on.

The books for the Red Press Company must also be dis-

tinguished from each other. To do this, the various books are listed in the order of their printing and numbered. Since there are but two letters in the symbol, the serial number of the book is placed between them—thus K65R indicates the 65th book made for the Red Press and is the symbol of this finished product appearing at the head of the account in the finished product stores ledger, on requisitions for this book, on manufacturing orders for the book, on correspondence concerning it, and so on.

This is the base for the symbolization of the parts of the products. The sheets of paper until printed, are designated as SK material. When in process they take the parts symbols, as for K65R, the 65th book for the Red Press. Since the sheets in process will be folded into folios, a number of which are assembled into the book, the symbol in detail would be K65R1F for the first folio, etc. When the book reaches the stage where all the folios are assembled, but the cover has not been added, this assembly will have the symbol K65RF.

In the same way the cover symbol can be K65RC, and the various assemblies or raw materials from which it is finally assembled are given more extended symbols or are known by the stores symbols. When the cover and the contents of the book become a unit, the distinctive symbols of the cover and the inside are dropped and the symbol becomes K65R. Thus with each assembly, a digit is dropped from the right-hand end of the parts symbols. This case is illustrative of the way in which all the product symbols are drawn up, but not every group of products lends itself to classification and symbolization as easily as books.

Classification of Special and By-Products

From time to time special orders are placed in the factory for production which cannot be identified with any regular product—for instance, a lot of paper boxes. Such an order

may be repeated but may have been taken to tide over a slack period. The V classification is for that purpose. In the same way, as unclassified general stores are symbolized by the injection of a numeral in the symbol SS, these special products are symbolized as V₁V, V₂V, V₃V, etc.

The study of Form 21 (page 97) shows that U is set aside as the base symbol for by-product stores, which, like general stores, are both classified and unclassified. Scrap paper when baled for sale is a by-product of the printing trade, and is a constantly recurring material. A spare or obsolete press or cutter is not. This then requires a separate classification. UL is used for scrap leather such as scrap belts and bindings; UP for scrap paper; UT for scrap type metal; etc. At most there are only a few classes. The occasional scrap item is U₁U, U₂U, U₃U, like other unclassified stores.

Classification and Symbolization of Other Activities

As already explained, symbols of materials may also be used as a means of symbolizing activities relating to these materials, such as order number series, operation numbers, etc. The opportunities for their use are unlimited. The most frequently occurring symbols are from the production order number series. A number following the material symbol denotes the lot number of that material being processed. A lot is the quantity of material which is to be handled or controlled as one unit. Thus a total order of 5,000 units might be split into five lots of 1,000 each for purposes of accounting or for ease in the execution of the order. The symbol K65R₃ would mean the third lot or edition to be processed of the particular book K65R. The use of the term "order" becomes almost synonymous with "lot" whenever a whole order is processed as one lot. Expense orders are similarly symbolized, using the bases A-E, as explained in the next chapter. Thus any symbol ending in a numeral and having the base A-V is a lot symbol.

Similarly a number preceding a material symbol denotes an operation in the processing of the material symbolized. 6K65R1F is the sixth operation on material K65R1F.

Classification and Symbolization of Adjuncts

Tools, machines, buildings, and building equipment are all classified and symbolized by the application of the same principles and methods to the base symbol of the asset account. For instance, the machinery inventory account might be XM. The individual machines are classified according to function, and then symbolized by adding characters to XM. When the last division of classes has been made, the machines are listed in order of size or capacity. XMP1C might symbolize the largest cylinder press; XMP2C the next largest; etc. The base symbol for buildings might be XB. If there were only one building, it and its inventory account would be XB only.

In the following chapter the classification and symbolization of the records as an aid in cost accounting work will be further considered as the elementary principles and procedure of cost accounting are explained.

CHAPTER IX

SYMBOLIZATION OF COST RECORDS

Function of Cost Accounting

Only such phases of cost accounting that have to do with the collection of cost data relating to the inventories are discussed in this book. Such costs are collected in order—

1. To determine which lines of product are profitable and which are not profitable.
2. To reduce costs through an intelligent study of the elements which compose that cost.
3. To allocate leaks and to stop unnecessary waste in the use of materials and of labor.
4. To compare the efficiency of machines, departments, operatives, materials, etc., which are working under similar conditions.
5. To compare costs of one period with another.
6. To compare actual costs with estimated or predetermined costs.

Monthly Reports

In every business the first desire of the management is to know the amount of the profits made during a given period, and the operations and transactions that have contributed to or reduced them. This information is summarized and furnished to the management by the accounting and cost departments on four managerial reports: the balance sheet, the profit and loss statement, the burden statements, and the cost statements. While the method of compiling these statements belongs to the province of accounting, it is advisable to describe here briefly the general content of each of these statements

and the relation of certain items contained therein to the problems of materials control.

The Balance Sheet

The balance sheet is a tabulated summary of the balances of the accounts carried on the general ledger. It reports the financial condition of the business at the close of the accounting period in two equal but financially opposite tabulations of assets and liabilities. Assets include current assets, such as accounts receivable and cash; the inventory assets under the heads of the stores classification; and the plant assets summarized in as many classes as are desired. Liability accounts include the current debts: vouchers payable, notes payable, and accrued wages; reserves for the depreciation of real estate and other plant assets; and the capital accounts showing the amounts due to stockholders and bondholders; and the surplus account. The surplus represents the difference between the assets and liabilities. Any increase between the surplus of one period and that of another represents the profit for the period; any decrease constitutes a loss.

The Profit and Loss Statement

The profit and loss statement is a detailed analysis of the income derived from the sales for the period of each class of product, from which figure are deducted the current expenditures, the remainder representing the profit or loss as the case may be.

In making up the statement the first figure shows the sales, from which total is subtracted the cost of the products sold to determine the gross profit. From this gross profit the general administrative and selling expenses are deducted, leaving the net profit or loss for the period. This figure is the increase or decrease in the surplus resulting from operations during the period, and will appear on the balance sheet, as explained above.

The Burden and Cost Statements

Burden statements summarize by purpose the expenditures, other than those for production materials and labor, incurred by and for the manufacturing departments, so that group and individual analyses of all expenditures may be made. By controlling the individual items, the total burden for the department is controlled.

The cost statements report the total cost and the unit cost of producing each kind of finished product. They are analyzed to show the elements or factors of cost which enter into the total, i.e., materials, labor, and burden. Where many lines of product are manufactured, each line composed of many items, it is usually sufficient to report to the management the number of units manufactured in each line and the cost of the line as a whole unless certain items are particularly important.

For any managerial statement to be of full value, it should tabulate the results of past periods for comparison with the current figures, thus affording the management the information needed to control expenditures.

The Budget

In addition to the preparation of these essential monthly reports, the accounting and cost departments in a large organization should prepare at the beginning of the fiscal year, an estimate of the total amount which the management expects to expend in carrying out the operating program called for by the estimated sales for the year. The preparation of this estimate is known as drawing up the budget for the coming year. Then as current expenditures are made and recorded they are compared with the detailed appropriations shown in the budget, for the purpose of noting any tendency to overrun the appropriations and disarrange the financing program for the year.

The preparation of the foregoing statements belongs to the

field of the accountants. It is the work of the accounting department and of the cost department, if a separate organization, to record the financial activities of the organization and summarize them in these managerial reports.

The Material Accounts

In recording transactions in the accounts shown on the above statements, the inventories play an important part. On the balance sheet they are represented by the classification of the stores accounts and the work in process account or accounts, which last cover the cost of all uncompleted work to date. The values shown on the debit side of these accounts have all been credited at some time or another to the liability accounts, such as wages or accounts payable.

Some balance sheets present inventory values under several classifications, whereas in other instances only the one item "Inventory" may represent the whole group of accounts, in which case the balance sheet would be supported by a schedule of the inventory accounts appearing on the general ledger.

The Cost Ledgers

The purpose and nature of control accounts and the use of subsidiary ledgers have been explained in the preceding chapter. In the accounting of a large organization, almost every item shown on the balance sheet represents a control account, and the number of such accounts with their supporting ledgers is limited only by the benefits to be secured from their use.

Usually when a plant is located at a considerable distance from the financial accounting department, the general ledger is split. All accounts dealing with the factory are recorded in a "cost" ledger or, as sometimes termed, the "factory" ledger because it is located at the factory. On Form 22, the accounts included are shown as A-V, although E is sometimes retained in the general ledger. The general ledger has a "cost ledger"

control account, and the cost ledger a "general ledger" account, so that both may be in balance at all times.

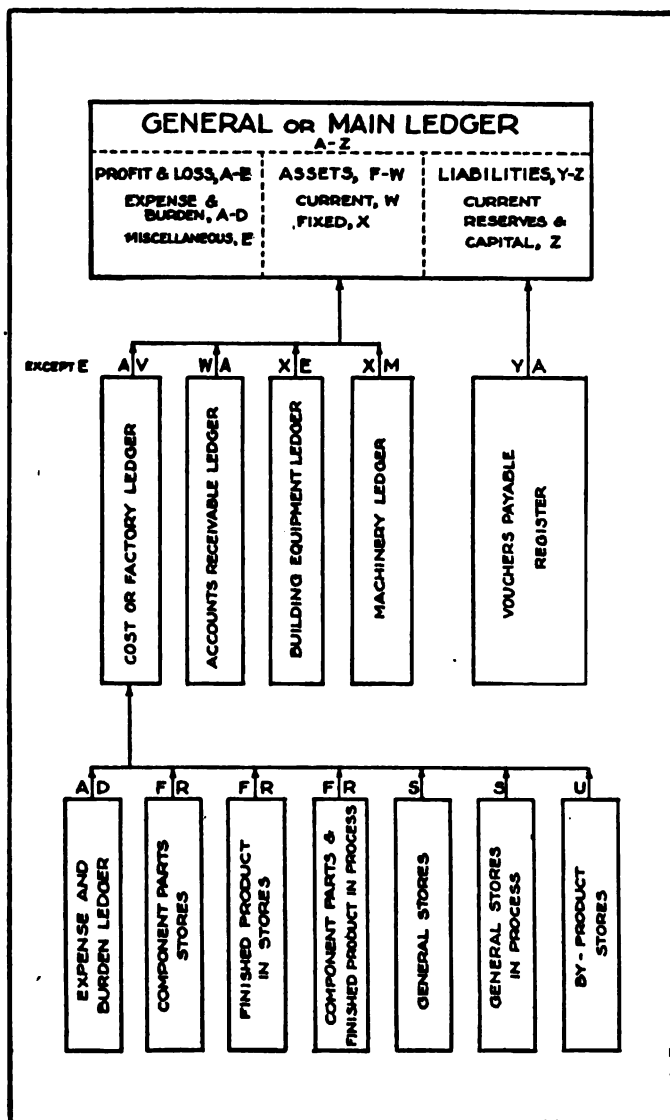
The cost or factory ledger, itself a supporting ledger, is supported by as many subsidiary ledgers as may be considered useful. The factory books are completed by the use of a "cost" journal for summarizing these factory transactions, recorded on the cost documents (stores requisitions, supplies requisitions, time tickets, etc.). Such summarizations furnish the totals and details for entry in the cost or factory ledger at the end of the cost period, the detail being posted to the subsidiary ledgers as the routine progresses.

Whenever the accounting department and the plant are located together or are in close communication, the cost ledger can be dispensed with. Instead, such controls as would be in the cost ledger are carried in the general ledger, and the subsidiary ledgers which ordinarily support controls in the cost ledger, then support controls in the general ledger.

The relationship between the main ledger and its supporting ledgers is shown in Form 22. While the cost ledger is shown in this chart, the following explanations disregard its existence.

Explanation of the Chart

As previously explained, the classification of materials is primarily based upon the classification of the control accounts. The reason for this, as shown on the chart, is that the values in the inventory accounts are finally converted into the values shown in the accounts which represent the current and plant assets. The study of the chart reveals that a cost ledger would be supported by the detail accounts in the A-V class. In the main or general ledger the current and paid assets are supported by those from W-Z. The letters from A-E are set aside as the base letters for departmental expense and burden and other profit and loss accounts, and those from F-V as the base letters for the various stores and work in process inventories. In the



Form 22. Chart Representing the Relationship Subsidiary Ledgers Bear to General or Main Ledger

Each block represents one ledger.

main ledger account the letters W and X represent the current and fixed assets, while Y and Z are the liabilities. At the end of each period the accounts in the class A-E are written off to profit and loss or distributed as burden over the month's charges to the work in process accounts F-V.

The merchandise inventory accounts F-V are of two kinds: the stores accounts and the work in process accounts, but the symbols of both are based upon the same letters. The stores controlling accounts represent all the materials which are represented in detail by the stores records—one record for each material; while the work in process controlling accounts represent the individual production orders in process with their attendant cost records. The use and form of these records will be explained in the next chapter. These groups of records make up the subsidiary ledgers for each of the two classes of inventories.

The expense accounts show the burden incurred by the various departments, and it is customary to allot to each department of the business a symbol as its identification sign. The symbol is then used for the classification of the charges for all material, labor, or money used for the benefit of a department. Thus A is used as the base symbol for the distribution or sales organization. To it are added other letters to identify the various departments of that division.

- AA – Advertising department
- AS – Selling department
- BA – Accounting department
- BC – Credit department
- BT – Traffic department
- CC – Cost department
- CH – Heat and power department
- CN – Control department
- CP – Shipping department
- DB – Bindery
- DC – Composing room
- DP – Pressroom

The expense or burden charges to each of these departments are in their turn classified into individual expense accounts, so that the charges for material or labor on the cost records can be marked with identifying symbols of the account to which they are to be debited. Thus AAA would be the symbol for the charge account for all advertising supplies used for the benefit of the advertising department (SA in the stores classification is the symbol for advertising supplies); AAB would be the symbol for the account for all stationery and office supplies used by the advertising department (SB is the symbol given to all office supplies carried in stores); and so on, throughout the various expense accounts—the symbols of all individual accounts and for each department being as uniform as possible. These expense accounts are maintained during accounting periods to secure the detailed information necessary to draw up the profit and loss statement and expense and burden statements, and to insure the accurate distribution of the burden charges to the department or activity responsible for their incurrence.

Inventory Account Symbols

In the inventory accounts F–V the situation is slightly different. Reference to the base classification in the preceding chapter shows J, K, and P set aside as the symbols for three classes of job, book, and periodical products produced by the concern, used as an example. As previously explained, the various classes of products are subdivided into groups for a more detailed symbol classification—for instance K represents the manufacture of books, and the following letter the kind of book classified by the customers; thus KR, symbol of the product, would be used as the base symbol of the accounts, representing the inventories of all items carried for the R customer—the Red Press. The number of control accounts carried depends entirely upon the desire of the management for detailed information regarding inventories. In a small

concern one or two of such controls might be ample, whereas in an elaborate accounting system the number of controls would depend upon the number of classifications of the product.

Similarly, in controlling the inventory of supplies carried in general stores, it might be advisable to operate several sub-controls under S—for example, SA for advertising matter, or advertising matter and office supplies might be lumped together in one account, SA-B.

Order Symbols

Symbols have a particularly useful field in classifying the records of the production department and in charging production orders. The operation of such orders will be explained in a later chapter. Here it should be noted that the use of orders is not only a convenience in the planning of production, but also furnishes a method of collecting the costs of production.

Methods of symbolizing orders may vary, but the same principles are universally applicable. For purposes of illustration the methods used in the printing business discussed in the preceding chapter will be further described.

In this system all manufacturing orders are identified by using the stores symbol allotted to the finished product when returned to the finished storesroom. All charges incurred in manufacture are classified and charged to orders by means of their identifying symbols.

As expense and burden charges are collected by departmental account, the symbol or identification of an expense order in this system of classification is the proper departmental expense account symbol—thus AAF is charged for the upkeep of the advertising department's furniture and fixtures. When the amount of a particular expense order is expected to be unusually large, it may be desirable to further identify the expense order in order to segregate the total charge for executive review. In this case the regular expense symbol would be followed by

a serial number (AAF65) the two figures constituting a special expense order number.

Order symbols are used on all stores requisitions, time cards, etc., as the means of identifying the order to which material and labor used in completing the work is to be charged. As the factory papers and documents are received by the cost department, the amounts are analyzed and posted to the cost sheet of that order, which cost sheet constitutes its work in process account. Summaries of these details are posted every month, or more often if desired, to the control accounts.

CHAPTER X

THE COSTING OF ORDERS

Methods of Costing Orders

In the manufacture of the finished product, materials may be processed in different ways. They may be transformed direct into finished product by mechanical operations performed upon them, as in certain branches of the textile trade; or they may be put through various processes which change their properties, as in the chemical, bleaching, and tanning trades; or the two methods may be combined; or again the materials may be first made into finished parts for assembly into the final product, as in the mechanical trades.

These and other variations in methods and conditions of production require the adaptation of the method of computing costs to the conditions of manufacture. For this purpose there are four methods of costing production orders and of determining the cost of the finished product or of each of the units produced. However, most plants will use all four methods in various phases of their manufacture.

1. **THE JOB OR ORDER METHOD.** By this method all production costs are charged direct to the job or order. The total cost of a job or order divided by the units produced, furnishes the unit cost of the articles produced. This is the method in most manufacturing-to-order plants and is practically always used for assembly work.

2. **THE CLASS COST METHOD.** Sometimes, two or more jobs or orders are grouped together, so that the total cost, when divided by a common unit, gives the cost for each job. For instance, in jobbing foundry practice all orders for castings

of approximately the same weight, the same metal, and of equal difficulty to make, are grouped together, and the total cost of molding them is distributed to the jobs or orders according to the quantity of each.

3. **THE OPERATION METHOD.** This method can be used whenever the total cost of performing an operation upon dissimilar parts of a number of orders can be distributed to those orders by dividing the total labor and burden by the number of units passed through that operation. This gives the cost of each unit, whether pieces, pounds, or feet. Sometimes, as in a tire plant, practically every operation can be costed in this way and a synthetic cost built up. The material cost is always kept separate and charged direct to the order.

4. **THE PROCESS METHOD.** This method is in some respects similar to the operation method. The total of all labor, burden, and material charges incurred in a series of operations forming a process is divided by the units produced to give the unit cost of the process. For instance, in an electric light plant, the material, labor, and burden charges are accumulated in one total and divided by the kilowatts produced, to determine the cost per kilowatt.

Plant increase orders are costed by the first method, but manufacturing orders may be costed by any one, or probably better by a combination of the four, depending upon the type of manufacture and the nature of the product.

Cost Documents

The documents or factory papers used for reporting costs and charging them to orders are of the several kinds enumerated below. In addition to their use for the purpose of gathering costs, these reports serve other important functions, which must be performed whether costs are compiled or not.

1. Time cards, showing how the daily time is to be distributed to orders. These cards serve as reports of the amount of

production completed during the day and for making up the pay-roll.

2. Stores requisitions, showing how the stores are to be charged to orders or departments. Requisitions are also the orders for the delivery and issuance of materials and the basis for the credits to the stores ledger controls.
3. Stores returns, reporting the return of unused material to stores.
4. Identification and routing cards, reporting to the stores records the quantity of manufactured parts and finished goods received into stores.
5. Expense debit slips, showing the expense accounts to which purchased supplies and services are to be charged.
6. Journal vouchers, reporting burden distributions and other general ledger distributions.

Each of these reports must state :

1. The account to be charged.
2. The account to be credited.
3. The nature of the charge or credit.
4. The exact amount of the transaction.

Handling the Cost Reports—The Time Cards

In handling the time cards (Form 51, page 233), they are first used to make up the production records. They are then sorted by pay-roll numbers for the pay-roll, to determine the total earnings and hours of each worker. The individual totals of all employees are then added to secure the departmental totals. At the same time a distribution by class of labor may be made into direct labor and indirect labor, and so on, for statistical and control purposes.

After the pay-roll department has made up its records, the time cards are sent to the cost department where they are arranged by order symbol and number. The direct labor is chargeable to manufacturing orders in detail, and to the Work in Process account in total; the indirect labor is chargeable to the expense orders in detail, and in total to the department

burden accounts. The grand total of all time cards charged to orders must equal the total pay-roll. This double method of sorting and addition, each made in a different department, checks the accuracy of the additions and insures that all labor charges have been charged to orders of one kind or another.

As soon as this proof has been secured, the cards are filed by order symbol. At the end of each accounting period, the expense or standing order cards are removed from the file and the total posted to the expense and burden accounts. When manufacturing and plant increase orders are completed, these time card charges are totaled and the total is entered on the cost sheet. Later the order will be journalized to the credit of the Work in Process account. The offsetting debits are to Finished Product Stores account for the manufacturing orders, and to appropriate plant asset accounts for the plant increase orders.

Production order costs or charges are recorded on cost sheets such as Form 27 (page 129), kept in what is known as "the work in process file," which file constitutes the work in process ledger. When an order is completed its cost sheet is withdrawn from the work in process file, charges posted, and unit and total costs reckoned, and filed permanently away as a record of the cost of the finished goods. Thus the work in process cost sheets or cost ledger shows the detail of the charges debited to the work in process controlling account at the end of the cost period. The file of completed cost sheets represents the detail of the cost of the finished goods taken into stores during the period.

Charges of various kinds are posted collectively primarily to save time and to avoid the entry of detail. If necessary, the detail of the summaries can later be analyzed in any desired way.

While time cards are posted collectively at the proper time to the order to which they are charged, their totals may be

posted daily to the control accounts receiving their value—Work in Process, etc. If posted daily, the control shows the inventory or balance as of the close of business of the last day posted. Otherwise the amounts can be accumulated on a proof sheet by controls and subcontrols and a monthly total posted at one time.

An excellent discussion of the handling and disposition of cost charges will be found in "Cost Accounting" by J. P. Jordan and Gould L. Harris.

Handling Stores Requisitions

The method of withdrawing materials from stores, with the resulting credit to the stores ledger and charge to the account receiving the value, has already been discussed in preceding chapters. As stores requisitions are the cost documents which give the detail of these charges, they must show the account which is to be charged before the requisition is honored.

The distribution of material charges and credits originating from stores requisitions is handled by sorting and adding them first according to the symbols of the stores control accounts for crediting the stores controls, after which they are arranged by symbols of the manufacturing, plant, or expense orders to be charged. Here again, this two-way method of sorting serves as a check on the accuracy of the totals. At the end of the cost period the stores inventory control accounts are credited by journal entry with the grand total of all requisitions for that class of material, and the controlling work in process accounts are charged with stores used on manufacturing or plant orders, while the departmental expense and burden accounts are charged with the supplies used. If materials symbols which index the stores controls do not appear on the requisitions, the stores records clerk must note in the proper space on the requisition, the account to be credited.

The adding of the requisitions may be facilitated by the use of a comptometer or a listing adding machine. If the lists

are made in proof-sheet form, checking and recording will be thereby simplified. As the daily totals of the material requisitions are secured, the amounts which are to be credited to the

SUMMARY — MATERIALS USED								
							MONTH OF _____ 1922	
CREDIT								
DAY	GENERAL STORES B	FUEL BY	COMPONENT PARTS STORES C	COMPONENT PARTS STORES D	ETC	ETC.	ETC.	FINISHED PRODUCT STORES F
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
TOTAL								

Form 23. Summary of Materials Used—Credit. (Size 11 x 8½.)

various stores control accounts are entered on Form 23, a working sheet for accumulating these figures for the month.

As before noted, the complementary charges to the accounts receiving the value are found in a similar way and entered on Form 24. Sometimes when the two distributions are made by the same clerk, these two forms are combined on one sheet.

The totals of Form 23 must equal the totals of Form 24, thus insuring accuracy. From the totals of the two distributions, the journal entries to be explained later are written up for crediting the stores controls and charging the controlling work in process accounts. The first analysis of the papers is usually made by the stores records clerks, and the second by the cost department. Thus one department's work checks that of the other. Following the completion of the distributions, the

requisitions should be filed by "charge symbol" until wanted for making up the cost or burden statements.

SUMMARY — MATERIALS USED								
MONTH OF 192								
DEBIT								
DAY	WORK-IN- PROCESS A	WORK-IN- PROCESS B	WORK-IN- PROCESS C	ETC.	ETC.	ETC.	ETC.	EXPENSE MATERIAL A-B
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
TOTAL								

Form 24. Summary of Materials Used—Debit. (Size 11 x 8½.)

The total of last column must check total material charges on monthly expense and burden statements

Handling the Stores Returns

Accounting for returned material is the reverse of the procedure described above. As previously explained, such deliveries should always be accompanied by a stores return (Form 16, page 79), and the amount credited to the party or the account returning the stores items should be the same as that charged when issued. The return can be priced from the stores record if the date of the delivery is known. In case the transaction occurred at some unknown time in the past, the cost or accounting department may be required to furnish the correct figure or an estimated figure may have to be used.

When customers and departments return stores items which have proved defective, the cost of putting the articles into salable or usable condition should be charged to whatever activity

is responsible for the deficiency. If defective through material or workmanship, the cost becomes a charge to the burden account of the manufacturing department responsible for the defects or to the vendor of the material, if possible. Repairs or adjustments made for customers, as a matter of sales policy, are sales expenses and should be charged thereto.

Reporting Deliveries to Stores

The delivery of purchased materials to stores is reported on a purchased materials received report. The nature of this form and its routing are to be discussed in Chapters XXVI and XXVII, as it does not enter into the cost accounting work. It is sufficient here to say that the stores accounts are charged and vouchers payable are credited through the general books of accounts.

Manufactured parts received reports are forwarded to the control department for entry on the stores records. Such reports may take a number of different forms. Some firms use the same report as for purchased material. Others use a somewhat similar but simpler form. The route card (Form 48, page 231), illustrates a simple but adequate method for most plants to report deliveries into stores.

A manufactured parts received report should show the department last working on the order, the symbol and description of the order, the quantity sent and accepted, and the signature of the inspector. The route card mentioned above accompanies the material from its beginning to its completion and delivery to the storesroom as manufactured parts or finished goods.

When orders have been completed and the costs reckoned, as discussed later in this chapter, the unit cost is reported to the stores records clerk by means of Form 11 (page 61) for entry on the ledger and for pricing requisitions as the parts are issued. When the plant is operated on a "to order" basis, formal finished product stock records may not be in operation,

in which case the cost department usually prices requisitions and performs all operations of crediting finished product stores and charging cost of sales. The cost department also tabulates the value of all manufacturing orders to make the credits to Work in Process and charges to Component Parts Stores or Finished Products Stores, as explained previously.

Journal Entries

The transfer of charges or credits from one general ledger account to another is done by journal entry showing the amounts to be posted to the appropriate control and the detail accounts in the general and the supporting ledgers. Such journal entries cover the summarization of time cards, stores requisitions, stores returns and manufactured parts received reports, thus recording the various transfers of material values from stores accounts to work in process accounts, and vice versa. In addition, journal entries are used for the distribution of expense charges to work in process and the department burden accounts, and for other miscellaneous transfers.

A journal entry consists of a tabulation of the accounts and the amounts to be debited and credited, with an explanation of the reason for making the transfers, as here illustrated :

J. E. No. 943			
Jan. 31	KR - Component Parts Stores.....	\$1,000.00	
	To KR - Work in Process.....		\$1,000.00
	K65RF2	\$700.00	
	K71RF7	300.00	
	Orders completed during the month.		

The first symbol indicates the Component Parts Stores account to be debited; the second symbol above designates the Work in Process account to be credited; the symbols below indicate that the detail amounts are from certain supporting work in process cost sheets. The positions of the amounts designate whether they refer to general ledger or to supporting

equal debit and credit and full explanation. This form provides columns for showing detailed accounts as well as control accounts, if the details are not too lengthy.

Handling Expense Debit Slips

As will be explained in detail later, the values of purchased material to be charged to the stores ledger control accounts are secured through the voucher register (Form 88, page 396) ruled with columns for distributing the charges. One column is for the entry of amounts chargeable to the stores materials accounts. The credits in the voucher register are usually to "vouchers payable." Another distribution column in the

ORDER NUMBER		INVOICE DATE OR NUMBER		VOUCHER NUMBER		DATE OF CHARGE	
EXPENSE LEDGER SLIP				ACCOUNT NUMBER	CREDIT ACCT.	DEBIT ACCT.	AMOUNT
QUANTITY	DESCRIPTION					PRICE	UNIT
						AMOUNT	QTY.
CREDIT ACCT.	DEBIT ACCT.	AMOUNT	REMARKS				TOTAL

Form 26. Expense Ledger Slip. (Size $7\frac{3}{8} \times 3\frac{1}{4}$.)

voucher register may be used for entering purchase amounts chargeable to expense and burden accounts and headed, for example, "Expense Ledger Accounts, A-D." For each entry in this column, an expense ledger slip (Form 26) is made out and passed to the cost department, where they are filed by account number like time cards and stores requisitions until the end of the month when they are totaled for the expense and burden statements.

Making Up Expense and Burden Statements

For purposes of analysis and control, the totals of expense and burden for each department are listed on monthly statements to show the actual amount of each kind of expense and burden incurred in each department. For comparative purposes, the amounts for the previous year should be shown in a parallel column. These monthly expense and burden statements are made up as soon as possible after the last cost reports for the month have been received and handled as described above. Then reports of all kinds are totaled by account symbols and listed. Some departments' expenses are to be apportioned among other departments. Accordingly, journal vouchers are made out and the proper postings made.

Tabulating Production Order Costs

It has been stated that production order costs are figured on the work in process cost sheets, and such sheets become finished goods cost sheets as soon as orders are reported as completed. Form 27 represents such a loose-leaf cost sheet or tabulation. This record sometimes serves as a notification from the control department to the cost department of the work to be done, and thus takes the place of a production order because it shows:

1. The order symbol
2. The quantity ordered
3. The date of the order
4. The ordered material's symbol
5. The ordered material's description
6. The operations on the material

The form here shown (Form 27) is used for the tabulation of ordinary operation and assembly costs. A description of the method of making entries on it is unnecessary, except that the total amount for each operation and each kind of material is posted rather than each detail charge.

COSTING OF ORDERS

129

COST OR ESTIMATE SHEET									
NAME OF ARTICLE						ORDER NO.			
ADDITIONAL DESCRIPTION						DATE			
NAME AND DESCRIPTION OF MATERIAL						UNIT	QUANTITY OF UNITS	UNIT COST	TOTAL COST
TOTAL COST OF MATERIAL									

DIRECT LABOR						SUMMARY			
NO	OPERATION	AMOUNT	HOURS	WAGE RATE PER HR	BURDEN AMOUNT	KIND OF COST	TOTAL COST	COST PER UNIT	
						MATERIAL			
						DIRECT LABOR			
						BURDEN			
						TOTAL PLANT COST			
						ADMINISTRATIVE COST			
						TOTAL			
						SELLING COST			
						TOTAL			
						+ % PROFIT			
						SELLING PRICE - ESTIMATE			
						" " QUOTED			
						ORDER HISTORY			
						DATE	QUANTITY		
						ORDERED			
						STARTED			
						COMPLETED			
						COMPLETION DATE			
						CONTROLLED BY			
						ON'D BY			
						COSTS REPORTED TO STORES			
						APPROVED BY			
REMARKS									

Form 27. Cost or Estimate Sheet. (Size 8½ x 11.)

The Work in Process Control Accounts

For the sake of simplicity it has so far been assumed that all production orders are charged to one Work in Process

account. It is often necessary for the purpose of analysis and control to divide Work in Process into three accounts—one each for Material in Process, Direct Labor in Process, and Burden in Process—and in very large plants to have separate accounts for each department. The total of the divided work in process accounts should equal the total of the one account if one only were used.

The Burden in Process account of a divided work in process account requires special mention. In using predetermined burden rates for computing costs a rate is reckoned which, when used over a period of a year, is expected approximately to equal the amount of actual burden which it is expected will be incurred during the year. When a furnace must be torn down and relined, for instance, the cost should be distributed over its period of life. In accounting for this burden, it is customary to use two burden accounts for each department—the “Burden Actual” and the “Burden Credit” accounts. To the first is charged all burden as it is accumulated, that is, the actual burden costs. To the second is credited all burden distributed to production orders in proportion to the direct labor incurred thereon for the period at the predetermined rate. By comparing the amounts of the two accounts, it is possible at all times to see whether the predetermined rate is large enough to absorb all the actual burden incurred, or whether the estimated burden charge is too great and is penalizing the jobs done. The difference between actual and predetermined burden is shown on the monthly profit and loss statement. Among other advantages, the use of this predetermined burden rate permits the compilation of costs before the actual burden rate for the period is determined, and permits costs to be more nearly standard or uniform.

This completes the brief description of manufacture up to the point where the deliveries therefrom are made to the storesroom.

CHAPTER XI

CONTROL OF INVENTORY

Effect of Policy on Inventory

We have seen that the inventories comprise two classes of accounts—the stores accounts and the work in process accounts—shown in the balance sheet in various ways, as the inventories of general stores, worked materials stores, finished product stores, by-product stores, and work in process for the respective classifications. The management is interested in the total values of the inventories as a guide in shaping future financial policy, for these totals, with those of the plant assets, represent most of the invested capital of the business. If the concern is in need of cash, the reduction of the inventories by sale or by decreasing production and purchases is a method of supplying the need. If the concern has a surplus of ready money, it may be practical to increase the inventories and thus save money by the purchase or the production of materials in advance of need.

In the control of the inventory the result of any changes in policy should be carefully kept in mind. To lower the inventory of materials on hand and “in process” will probably improve the immediate financial position of a concern; but the greater the quantity of stores within reasonable limits, the better will the stores department be able to supply the needs of the consuming departments. From the point of view of quantity the needs of the consuming departments should first be considered, while the limitations of good finance govern the uppermost level to which the value of the inventory should go. The financial position of a concern suffers as soon as

the inventory amounts become too high, and it is to guard against this condition that a control of the upper limit of the amount is desired. The useless, wasteful, and unnecessary outlay of cash for materials not needed can be avoided by regulating the total values.

Inventory Carrying Charges

The carrying charges for all materials in stock, which charges include insurance, taxes, depreciation, rent, and manual and clerical labor, plus the interest to be earned on the investment, probably amount to from 10% to 20% per annum of the value of the stores. For instance, a certain material costing \$200 may be held in inventory for six months before being used and its carrying charges may amount to \$20, yet the expense must be absorbed as overhead and not as an increase in the cost of the material. Strictly speaking, that material at the end of six months has cost \$220—but is still worth only \$200. These charges should for strict accuracy be included as part of the costs of the materials used, but the detailed accounting necessary to do this makes it impracticable.

If the inventory of certain materials is allowed to increase or even to remain stationary, there is also the possibility that the material will suffer damage or will deteriorate to a value far under its cost; or it may become entirely obsolete and not usable for the purpose for which procured. There is also the possibility of the market falling in price at the very time the stocks are at their highest, and the true value of whatever is on hand is decreased accordingly. Hence, the management in deciding upon the maximum quantity must give some thought to carrying costs and the chances of loss of stock. Charges increase proportionately with the quantity stored, and the length of time the item is in stock and may quickly overcome the advantages of buying or of manufacturing solely for the sake

of a low unit price. An accurate estimate, however, can easily be made and should always be made when considering the carrying of materials in stores. This estimate should be figured as a per cent of the value of the material.

It is not to be supposed that every one of these factors will be minutely determined for every material every time an order is to be requisitioned, but if the subordinate to whom this matter is entrusted, is given the proper records and statistics and is kept informed of current general conditions, it quickly becomes second nature to determine the expediency of placing orders. The work becomes routine, takes but little time, and each correct judgment insures accuracy in succeeding estimates.

The Consideration of Quantity

Manufacturing and sales policy govern the lowest limit to which the inventory should be allowed to drop. That limit represents the consumption during the time required to obtain a new supply. The sales department requires the quantities in finished product storesrooms to be such as will meet their schedules. There are the same advantages of lower unit costs in large-scale production as in large-scale purchase, and the quantity put in process should not be allowed to drop below the point where such advantages can be secured. Finally, the manufacture of the components in process should be so co-ordinated that they will be finished on time when required for final assembly operations. In this matter there is often a lack of balance, resulting either in an oversupply of items or parts which will not be required for some time, or in holding up subsequent operations of assembly. The deal is, of course, the greatest amount of business possible with the least amount of capital invested per unit of product manufactured over a given period.

Control Procedure

The specific methods and forms to be used to effect the control of inventory will be described later. Here it is necessary to emphasize the need of a well-organized and definite method of procedure to carry out the work. A mere decision of the management does not accomplish this control any more than a decision that sales must increase brings more orders. There must be a system of applying the decision in detail to the separate groups of stores and then to the single items. The method must be simple in plan and in operation so that all may comprehend it. At the same time it must be thorough and uniform and if it is to be inexpensive in operation it must provide for handling an expansion or contraction of stores with ease and speed. Finally it is of the highest importance in controlling inventories that the inventory figures presented in the monthly balance sheet be correct, otherwise any policies decided upon will be inconsistent with the actual conditions. Accordingly, then, the stores department must be clerically up to date and the records accurate.

The controls of the stores and work in process accounts should show the true condition of the stores inventories and the work in process. Therefore the materials ready to be turned into stores should be promptly forwarded by the production departments to the storesroom, so that work in process accounts may represent only materials actually in process.

Determination of Ordering Points

The management exercises control over the inventories only to the extent of indicating the maximum total values of the different classifications to be maintained for a given period. This decision must of course be based on general business conditions, the financial status of the concern, unfilled sales orders, turnover, and any other factors which bear upon manufacturing policy. When the market is falling and a period of re-

trenchment has set in, inventories must be reduced to the lowest limits of safety and any surplus converted into cash as soon as possible. When the market is rising and a period of expansion and increase in volume of business is looked for, heavy contracts are naturally placed for the purchase of materials. In either case, however, the figures to which the totals are to be reduced or raised should be definitely determined.

[After the amounts of the controlling accounts have been limited and apportioned to their subcontrols, the work of controlling the separate items is left to a subordinate. Certain instructions for his direction should be drawn up, such as the maximum period during which stock is to be kept on hand and the minimum value of the single order to be placed. Because the work of ordering new supplies is given to a subordinate, it is not unimportant.]

The routine of ordering materials included in the inventories as explained in Chapter VI, is governed by the ordering point and economic ordering quantity—data which are entered on the stores record. A mistake of judgment in fixing too low an ordering point may result in a loss, through delays in the manufacturing departments, out of proportion to the small economy effected. An “economic ordering quantity” is too low when it increases the unit cost unnecessarily. As previously stated, the quantity making up the ordering point should be the total of the amount required for average or expected consumption during the time ordinarily taken to secure a new supply plus a margin of safety. Errors of calculation in requirements, unavoidable delays in deliveries, increases in consumption—all these factors must be covered by the margin of safety.

Determination of Minimum Ordering Quantity

The minimum ordering quantity should be the minimum quantity which can be economically purchased or manufactured

at one time and then stored until wanted. To determine this requires a review of all the factors of stores handling expenses which influence the economic cost, as well as the purchasing or manufacturing expense. In practice the upper limit of the ordering quantity is set by the sales or consumption schedule.

The amount which the stores records clerk requests on an order requisition and the balance available at the time the requisition is signed, are not necessarily the same as the "ordering quantity" and "ordering point" entered on the stores record. These quantities are intended to serve as *guides* to the forming of a judgment on each requisition. Conditions are changing from day to day and the signature of the head of the stores record department should not be affixed to an order requisition until each requisition has been studied and the conditions affecting the order have been reviewed.

Economic Minimum of Manufacturing Cost

In determining the quantities of materials to be purchased no special problems arise, as their cost is given in the quotations of sellers, to be discussed in a later chapter. In determining the minimum quantity of parts to be made, the control department has to consult the manufacturing and estimating departments. The initial cost is largely governed by the time required for preparation and for setting up the machines, and this cost is the most important consideration in determining the "minimum quantity" to be put into process. Usually the costs of materials and labor vary directly with the number of units completed. For instance, in making a part for a machine tool it might require two hours to set up a lathe for turning that part, and if only one part is ordered, the unit cost is of course proportionately high. The clerical work of placing the order probably costs over \$1 in each case. Though as a rule the more parts ordered, the smaller will be the unit cost of manufacture, this unit cost soon reaches an economic minimum.

Graphing the Consumption

As an aid to the forming of a correct judgment, when an item of stores reaches the "ordering point," its consumption should be reviewed to see if a change has been made expedient by changing conditions. Form 28 is designed to make such a review easy. It will be noted that the lower part of the form graphically presents the record of consumption for a period of two years. Whenever the stock falls to the ordering point, one of the cards is made out to show the consumption to date. From left to right the lines represent the months, while from the bottom to the top, the spaces are for the quantities consumed, using whatever scale best suits the case. The spaces above the graph are filled in by the stores records clerk and by a person familiar with the securing of the material, such as a member of the purchasing or the production control department.

When the executive of the control department responsible for the "ordering quantities" and "points" studies this chart, he is able to tell at a glance the trend of the consumption for the period charted. This information, with his general and his specific information of future manufacturing requirements, enables him to make any needed changes in the ordering point and ordering quantity. If a change is made, the new quantities are placed on the stores record and the proper action taken while the chart is filed by its symbol until the ordering point is again reached. Then the consumption curve and other data are brought up to date and the card is again ready for the decision of the reviewer.

The expense of maintaining these graphs is very slight. The cards can be used again and again and little time is needed to bring them to date. The system has been used at a weekly cost of about \$30 in a stores organization handling over 20,000 items inventorying over \$400,000. Inventories were cut \$100,000, saving at least \$10,000 in carrying charges alone—and the operating cost was \$1,500 a year.

Control of Finished Product Inventory by Production Orders

The amount of any inventory of any finished product or of any material entering into the product should be based on the estimated future sales, covering the period for which it is necessary for the production division to plan their work. That is, if the manufacturing department requires four months to complete the product, from the securing of raw material to the delivery to stores, before the first of each month the sales manager should complete his sales estimates for the fifth month from that date. The estimate may include items for delivery during several successive future months. For obvious reasons such estimates are only practical for orders filled from stock. For those special products not manufactured in advance of actual sales but the sales of which can be closely figured from past experience, the estimates can only approximate the quantities of basic parts and materials required. A statement of future sales requirements should be forwarded to the stores records monthly and the quantity should be posted to the requirement columns of the stores record, after which the records are reviewed to secure any additional stocks needed to fill production requirements.

Planning for Materials and Supplies

In planning future materials and supplies requirements, the quantities of each kind of raw materials, component parts, and manufacturing supplies required for assembling or manufacturing the finished product should be listed on Form 44, (page 228). A copy of this record is filed in the control department. From it the quantities of materials required for orders are secured for posting to the appropriate stores records. If necessary, order requisitions are immediately written for those materials not available. In this way a close check is kept on both materials and parts required for turning out the finished product. Also requisitions for new stocks cover re-

quests only for quantities actually needed for the production of the finished product which the sales department states they will be able to sell during a given period, and a control is secured over the inventory of all materials entering directly into the production of finished product.

Control of Work in Process Accounts

Without an adequate control department, most plants unknowingly drift into the condition of having several times too much material in process, the bulk of which is often represented by comparatively few parts. Every production order issued means an increase in the work in process and then later in the stores accounts, and the cost of the material used is increased by direct labor and burden charges. Therefore, attention should be paid to the number of manufacturing orders "drifting" through process. To set standard limits to work in process, the same principles should be applied as to materials. A standard or maximum quantity to be in process at any time should be set so as to insure an adequate yet not an excessive supply, special attention being of course concentrated on the more important items. An attempt to decrease the work in process inventory often results after a short period in a large increase in the raw materials inventory and a light finished product inventory, especially if a policy of retrenchment has been adopted. However, since in practically all cases it costs less to store raw materials than to work them and then store the products, it is much better to have the larger raw materials inventory, especially as it is easier to convert them into cash if need be.

Control of Supplies and Non-Productive Materials

In the case of materials which do not enter directly into production, such as office and some manufacturing supplies, the "ordering point" and "ordering quantity" must be set more

arbitrarily than for the materials used in production. As the requirements during certain periods have little direct connection with the advanced planning of production, and their immediate use is seldom known very far in advance, the ordering of replenishment quantities is more of a gamble than ordering production materials. But the consumption graph (Form 28) is almost a sure index of future requirements.

Usually miscellaneous work on plant orders can be and is controlled in the same manner as the production of parts for finished product, if the time allowed for delivery permits.

CHAPTER XII

STANDARDS AND SPECIFICATIONS

Definition and Purpose

A standard material or method, as the term is used in this book, signifies that material or method which has been selected as the best for attaining a given purpose and is therefore to be used for that purpose. The standardization of methods is just as important as that of materials. The chapters to follow on handling and stowing materials, contain simply hints for working out standard methods for doing these things. This chapter is chiefly concerned with the standardization of materials as an aid to their identification and procurement.

The war brought home the advantages and economies of standardization to many who had not before realized them. The Conservation Division of the War Industries Board aimed to have the various industries of the country eliminate all unnecessary labor, and this included as its primary essential the diminution of the variety of products manufactured. An editorial in the *New York Times* thus summarized the situation :

Fabric mills are showing one thousand styles but the bulk of the trade is done in one hundred or two hundred. A discontinuance of 800 styles would release a great amount of material, capital, machinery and labor. The styles of shoes might be reduced by one-half; the shades of paint by two-thirds; and automobile tires from 287 sizes to 10 or 12. In one New Jersey town the grocery stores released 55 men by reducing their deliveries to one daily. Twenty-six department stores have reduced their delivery force from 600 to 218 men and from 241 automobiles to 97.

The automobile tire manufacturers agreed to reduce the number from 287 styles to 32 at once, while the 32 were to be reduced to 9 types and sizes by November 1, 1920—fifteen months later. Official reports said that the motoring public would suffer no inconvenience, as the industry would be adjusted so that the standardized types would fill both the old and the new conditions. These examples drawn from war conditions illustrate what can be done given the will to do it, and much of the good temporarily effected then has become business policy today.

Advantages of Standardization

By standardization there is a general saving all along the line of materials control. How much does it cost to put an order into process or to make a purchase? If the number of manufacturing orders could be halved, approximately half the clerical work necessary at all stages of a product's manufacture, and from its reception into stores and its delivery to customers, could be saved.

In the experience of every concern some material is found to be out of stock at the time it is most desired. To a certain degree this cannot be avoided, as conditions are not always favorable for obtaining a new supply; but if standardization has not yet been carried out, investigation of the stores inventory would in all probability reveal some unnecessary material whose value could be added to the margin of safety of a standard material. Sometimes a number of materials are purchased or manufactured and are carried in stock, any one of which could be used in place of the others with a slight change in design or other feature of the article. Such near duplication causes a loss, not only because of the unnecessary investment and carrying charges, but also because the larger the amount of material purchased or manufactured at one time, the lower will be the unit cost. By the elimination of

small lots the standard materials can be secured in greater quantity, thus producing or purchasing on a larger scale with a steadying of the flow of supply.

Standardization has the further advantage of requiring the department consuming the material to find out and to state exactly what kind of article is needed and the conditions it must meet. This results in a product of even quality and in satisfied customers, as no purchaser cares to buy from a house whose output varies in grade from month to month.

Determination of Standards

In selecting a standard material for a given purpose, it is necessary to study it from three points of view :

1. How many uses can this material be put to and in which departments can it be used?
2. What other materials resemble this material and can the one be substituted for any other?
3. What quality of this material will be good enough for the purpose it is to serve?

The answers to the above questions can often be given only by the expert who is versed in grades and qualities and who thoroughly understands the manufacturing requirements to be filled. While as a rule the executive responsible for the selection of the materials used in the manufacturing plant occupies his position by virtue of his special training and experience, a better method and more modern practice is to vest the selection and standardization of stores items in a committee of manufacturing and purchasing experts. The specialized knowledge of each is thus made available for all, while the standards set become part of the records maintained by the methods to be here explained.

The standardization of materials should be carried out simultaneously with the preliminary classification. Useless and unnecessary materials should be rejected first of all. The fewer the number of items to be classified, the fewer and

simpler will be the symbols to be adopted. As soon as the first listing for the classification of the materials already in stores has been made, standardization should be begun and completed before the final classification and symbolization of the items of stores.

In deciding on a standard for raw material, the decision must primarily be based upon the requirements of the internal organization, and in deciding on finished product primary consideration must be given to salability and the wishes of customers as a matter of sales policy. Finished product should be standardized first, then component parts, and finally raw materials and manufacturing supplies. Miscellaneous supplies, such as stationery and belting, should also be standardized.

Organization for Standardization

To standardize there must be a central authority for directing and controlling the work. The control department should make the classifications and symbols, for it controls the records, giving most of the information desired for both the establishment and the maintenance of standards. The work of standardization is similar to and parallels the regular work of the control department. Much of the data to be considered is taken from the stores records and what is not directly found therein is found in sources referenced by the record. This department, then, is in the best position to correlate the various qualities required of each material and may well direct the work.

Since many considerations need to be given weight in choosing any material as the standard, and as there may be several departments to be consulted in order to get a full and rounded opinion of the needs of each case, committee action is most desirable. The discussion should be impersonal and open and each department should be encouraged to present its requirements in detail.

In regard to this, Walter Glenn Scott writes:

Standardization is a group decision, fixed in a sense, but tentative on the development of something better, or more adaptable to a purpose. It is a judgment based on the experiences of a majority, the masses, rather than the individual. Conception, or development, may be due to individual effort, but recognition and acceptance must be the composite decision of many minds before it can be called a standard. It is the ladder used in the gaining of ideals.

The departments interested in any one material are not many. The engineering department, if such a department exists, should be represented as the technical authority for the relative efficiency and value of all materials in use. The sales department, as representing the consumer of the finished product, should give the data regarding the use of the finished product. The purchasing department or the manufacturing department is the authority for determining the cost limitations of the materials under consideration.

As soon as the work of each member of the committee has been decided upon, the usual course is to take up each item or article of those already in use for any purpose and to investigate the physical properties (quality, size, color, quantity used, etc.) required of each to meet the conditions of use. This information is then tabulated. If any obvious duplications or unnecessary items appear, the more expensive or less efficient are eliminated at once. In this way a complete statement is drawn up of the properties that one article must include to be the standard for all purposes. With this specification as a guide, the purchasing department canvasses the field for such an article with adequate sources of supply if the material is purchased, while the engineering department endeavors to redesign a part or product that may be interchangeable for all purposes, or, if necessary, to design a new part or product.

Example of Standardizing Materials

A simple example of the work of standardization will not be out of place. In a certain plant there were in use five different kinds of small envelopes. No. 1 was used by the personnel department to enclose the badges given to employees, the only requirements being that of size—larger than 2 x 4 inches. No. 2 was used by the paymaster's department for enclosing the wages paid to each employee. It had to be strong enough to hold the coins and not over 3 x 5 inches in size to fit the trays in the cases carried by the paymasters. No. 3 was used in the company's hospital for dispensing drugs and had to be over 2 inches square in size. No. 4 was used by the assembly department for issuing screws and small parts to assemblers, and its requirements were the same as No. 3. No 5 was used by the offices for sending messages to the offices or shops.

The study of the different purposes served by the several envelopes showed that one envelope could meet all requirements. The tabulation gave a full description of what was needed—an envelope of any color, any quality, strong enough to prevent coins from tearing through the paper under slight handling, any size larger than 2 x 4 inches and smaller than 3 x 5 inches, with a supply of 200,000 per year. With this specification, the purchasing department secured bids from envelope manufacturers, and the standardization committee found that a size costing less than any size or quality in stock could be secured in ample quantities from several sources. That envelope was chosen as the standard and the saving in the cost amounted to about \$80 per year. In addition four items were cut out of the classifications and symbolizations, and the clerical work of maintaining five stores records was reduced to one record. The storesroom handled one material instead of five, and the purchasing department made one purchase instead of five.

The standardization of all materials proceeds as illustrated above.

Example of Standardizing Product

The standardization of the finished product results in as notable economies as does the standardization of other items of stores. A manufacturer known to the writer lists in his catalogue 4,000 varieties of one kind of product of small unit value. Of these he attempts to stock only a few hundred items. This large number is assembled from about 300 different kinds of raw materials and component parts. While orders are received from customers for practically every one of these 4,000 kinds, the completed products vary but little. In fact they are so similar that probably any one of ten different kinds could be shipped on an order without any detriment to the customer's requirements and even without his recognizing the substitution except for the label on the carton. Orders in quantities of fifty up, are accepted for any one of these products, and the sales department endeavors to supply exactly what is requested. This means that the 3,700 varieties which are not stocked and orders for which comprise one-twelfth the total, must be specially assembled for shipment within 48 hours of the receipt of the customer's order. The confusion and the difficulties which this presents to the assembling, control, and sales departments of this organization are obvious.

Under ordinary circumstances it is annoying to customers to restrict the variety of products unless such restriction proves of benefit to them as well as to the manufacturer. There are three inducements for securing customers' consent to the reduction of the varieties of product—better service, better goods at the same price, or better price for the same goods. To offend customers to the point of losing profitable orders in order to save a small amount in costs is of course a penny-wise and pound-foolish policy.

In the case cited the manufacturer studied his sales statistics and found a large number of items with few sales during the past year. These he eliminated at once. Then instead of refusing orders for any products except those retained as standards, he persuaded his customers to restrict their orders to a smaller number of kinds. When the demand had practically ceased for certain items, he dropped them from the catalogue. Of the 1,000 varieties finally retained as standard, 600 comprised 95% of the total business. The mere cataloguing was an invitation to order them and meant more work without corresponding profit for his organization. While his line still contained many unnecessary items, these were not immediately dropped for reasons of policy. By offering a better discount on the catalogue price of the goods he wanted to sell, the manufacturer led his customers gradually to the purchase of a few standard lines.

Specifications

Once the standard is decided upon, a written description should be prepared specifying every characteristic the material is required to have. This description is the "specification" for that material and as such will be used by the manufacturing and purchasing departments as defining the various properties which the material must have and must not have.

The use of the specification varies with conditions. Some plants dispense with them entirely. Others specify minutely most articles purchased or made. It is probable that almost every plant has specifications covering its finished product. They may not be known by that term although they may have long been used by the inspection department in passing products as fit for sale. Manufactured parts may also be covered by specifications—blue-prints of standard parts drawings—especially when articles are intended to be interchangeable or are inspected before being turned into stores. To sum up,

every item kept in stores or listed in the inventories should be covered by a specification to insure its exact replacement when required.

A specification may begin with a statement of the processes by which the material is to be made, if the process is likely to affect the quality of the material as in the case of steel. This may be followed by a statement of the chemical and the physical properties wanted or not wanted and the tests by which the presence or absence of those properties is to be detected. This matter of tests is important and should never be omitted, as it saves disputes and defines in advance how quality is to be determined. The usual and the most satisfactory way to express properties is to state the upper and lower limits allowed. For instance, a certain grade of steel may need to have not less than a given per cent nor more than a somewhat higher per cent of carbon. Sometimes only one limit need be specified; for instance, the tensile strength of steel may be at least so much, and as high as the maker chooses.

The workmanship and finish and size or weight, etc., should also be described when necessary. To be complete, purchase specifications should also state the packing, marking, and shipping directions. It may also be advisable to specify when the inspection of the material offered under the description is to take place and what disposition is to be made of any article rejected by the purchaser.

Model Specifications

Purchasers and producers of practically any basic raw material and of many semi- and wholly-manufactured articles will find in public records specifications covering almost every kind of standard or staple article. Professional societies, such as the American Society of Mechanical Engineers and particularly the American Society for Testing Materials, have

drawn up specifications covering most of the basic minerals. The catalogues of many manufacturers and dealers afford valuable information, as do also the bulletins of the Bureau of Standards of the United States government. Again, the government's annual "General Schedule of Supplies" furnishes excellent specifications of a large number of items. A few illustrations of the general style and wording follow:

Ink, blue-black, writing fluid; must be securely packed in wooden boxes sufficiently strong for reshipment.

(1) The writing fluid must be gallo-tannate of iron ink, not inferior in any essential quality to one properly prepared after the following formula, in which all the ingredients are of the strength and quality prescribed by the United States Pharmacopoeia, and the per cent of true acid present in the sample of tannic acid used has been determined by the Loewenthal and Schroeder method:

Take of pure dry tannic acid, 23.4 grams; of gallic acid, in crystals, 7.7 grams; of ferrous sulphate, 30 grams; of dilute hydrochloric acid (U. S. P.), 25 grams; of carbolic acid, 1 gram; of dye, bavian blue (D. S. F.), Schultz and Julius No. 478, 2.2 grams; make to a volume of 1,000 cubic centimeters at 60° F. with water.

(2) Deliveries will be subjected to the following tests, as compared with the standard ink described above:

(a) A fluid ounce allowed to stand at rest in a white glass vessel, freely exposed in diffused daylight for two weeks to the light and air, at ordinary room temperatures, protected against the entrance of dust, must remain as free from deposit upon the surface of the ink or on the bottom and sides of the vessel.

(b) It must contain no less iron, and must have a specific gravity of 1.035 to 1.040 at 60° F.

(c) It must develop its color as quickly.

(d) After a week's exposure to diffused daylight the color must be as intense a black when used upon paper, and it must equally resist changes from exposure to light, water, air, alcohol, and bleaching agents.

(e) It must be as fluid, flow as well, strike no more through the paper, nor remain more sticky immediately after drying.

(3) The bottles must be labeled neatly, conformable to a form to be prescribed, and such form of label must not be used on bottles containing inks not manufactured for the Government: neither shall this form of label, or any similitude of it, be used in connection with any advertisement, circular, or other publication emanating from the establishment of any private individual, company, or corporation. Labels for bottles of Government standard writing fluid must be printed in blue, on white paper. The name and location of the manufacturer may, if so desired, be placed on the labels.

(4) The successful bidder will be required to furnish the standard inks, subitem a, in flint-glass bottles; each quart bottle must contain 32 fluid ounces, each pint bottle 16 fluid ounces and each half-pint bottle 8 fluid ounces.

Hose; best quality; couplings to be attached to hose, when so specified:

NOTE.—Upon request, the Bureau of Standards will advise ordering offices whether hose delivered complies with requirements. A 3-foot section of hose must be furnished, with request, for test.

- (a) Water; in 25 or 50 foot lengths, as ordered, full lengths only; on samples and specifications—

All water hose must be soft and pliable, made of long-staple cotton duck, good quality rubber tube, cover and friction.

Inside of tube to be smooth and free from cracks or imperfections; minimum thickness of tube $1/16$ inch, of cover $1/32$ inch.

Each 25 or 50 foot length of hose to be branded with trade-mark, name of maker, and date cured.

Each 25 or 50 foot length of hose to be provided with male coupling at one end and female coupling at the other end; couplings to be approved form and securely fastened with clamps.

Strips of rubber $1/4$ inch wide cut longitudinally from tube and cover of plied hose when stretched 300 per cent (2 to 8 inches) for 1 minute must show not more than 25 per cent set in 2 inches, measured 1 minute after release. Specimens while under tension shall show no pits, holes, or imperfections due to particles of foreign matter.

Friction of plied hose determined on a 1-inch section cut from any part of the hose shall be fairly uniform and not exceed 1 inch per minute under a 15-pound weight.

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Steel; on specifications:

- (a) Cold rolled; weight per cubic inch is 0.2833 pound; specimens 2 inches long between measuring points to have an ultimate tensile strength of not less than 80,000 pounds per square inch, an elastic limit of not less than 55,000 pounds per square inch, an elongation of not less than 10 per cent, and a contraction of area of not less than 25 per cent; bars with dimensions of $3/4$ inch or less to be tested full size as rolled, bars greater than $3/4$ inch may be turned down to a diameter of $1/2$ inch; cold-rolled steel to contain not more than 0.06 per cent of phosphorus, nor more than 0.06 per cent of sulphur; bars must be perfectly straight and true to the size specified, and must be free from cracks, flaws, seams, or other injurious imperfections, and have a workmanlike finish.

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Cotton drilling:**Unbleached—**

44 inches; on sample and specifications.....

MATERIAL.—Shall be made from long-stapled, sound-fiber cotton, free from shives, motes, or adulteration.

QUALITY.—The fabrics shall be a good quality, evenly spun and woven, and commercially free from faults.

WIDTH.—Shall be not less than 44 inches nor more than 45 inches when finished.

WEIGHT.—Shall be not less than 12 ounces per linear yard.

CONSTRUCTION.—Shall be not less than 54 threads of warp nor less than 46 threads of filling per inch in the finished cloth.

TENSILE STRENGTH.—The warp shall be not less than 100 pounds, and the filling shall be not less than 90 pounds.

FINISH.—The fabric shall be soft finish and shall be free from "loading" of any kind.

Specifications in the Purchasing Department

Specifications are of particular importance in the work of the purchasing department, giving them a definite and explicit description of what they are to buy. This exact knowledge of what is needed is in turn passed on to the supplier, enabling him to get a clear idea of what he is asked to furnish. He cannot misunderstand and his bid must be for the same material as his competitors supply. If he is awarded a contract, any substitutions and adulterations—intentionally or otherwise—can be immediately detected on the inspection of the material after its receipt. Nothing is left to chance, to guess-work, or to trade-names which never have as definite a meaning as a complete specification.

Prices, and materials "made to meet a price," are constantly changing, but when prices are based upon a specification, they can always be accurately compared at all times, as they are based on a material of the same quality. While such matters as the process of manufacture or the disposition of rejected parts is not always pertinent to production specifications, all necessary details need to be specified in purchasing materials to avoid confusion and misunderstanding. Moreover, there is always the possibility that at some time a manu-

facturing part may be purchased. Then these seemingly superfluous details become valuable. No purchasing department should fail to encourage the building of a complete set of specifications for at least all materials regularly purchased.

Maintaining Standards

When the task of standardization has been completed, the results of the work should be made as permanent as possible to guard against the deterioration in the standards set. This permanency can be secured by the establishment of a control through a central approving authority on the specifications of materials purchased and manufactured, and by keeping proper records of the products affected by any change in a raw material and of materials and parts affected by changes in products. This last method of control is illustrated in the standard production analysis records (Forms 44, 45, and 46), to be described in Chapter XVIII on "Graphic Production Control." Every product is covered by a record of all materials and parts used in its production, and for every article there is a statement of the products into which it goes or the uses to which it is put. This is also on the stores records. Then if a product is discontinued, it is easy to determine the materials thereby affected; and if the supply of a material fails, or changes, there is a record of the products or uses affected.

The control department is the logical agent for exercising the controlling authority over production materials, since no stores of any kind can be ordered without its approval. This "board of censors," if it is a *control* department, controls the origination of all stores requisitions. The requests to stock material should be investigated before approval and, if possible, a standard article substituted, in which case the original request is of course killed. The majority of the needs of special materials are caused by manufacturing a special product or for carrying out a special project. In such cases the en-

gineering department will have forwarded to the control department as a part of its plans, a list of the special materials or parts to be secured either by purchase or manufacture. When requirements are specified in that way, the items are procured without question. But if no central responsibility exists for requesting specials, the miscellaneous requests of the plant must be subject to strict questioning. As before stated, materials regularly stocked can often be substituted for special requirements.

Periodical Revision of Standards and Specifications

Though materials may be standardized, the standards of today may not be applicable six months hence. Therefore it is necessary to review them periodically, adapting them to new conditions or requirements or improvements in what the market offers. Often the need for a material passes and it becomes possible to eliminate the item and use up, sell, or get rid of the available supply in some other way. The storesrooms should not become clogged with obsolete materials occupying space that could be put to better use. In nine cases out of ten the control department is not advised when the use of a material or supply is discontinued. Therefore, it is necessary for its own protection to review the records periodically, to see if the items represented thereon are in demand. If investigation shows any item to be obsolete, it should be discarded.

The purchasing and manufacturing departments may be able to suggest many possible changes in the standards as new materials and methods are called to their attention. Technical matters should be referred to the engineering department for a decision, and office supplies to the office manager, and if the standard is changed, new specifications should be drawn up. By such means as these the items of stores are kept up to and within the limits of requirements, while the inventories are carried on the books at their correct figure.

CHAPTER XIII

ARRANGING AND EQUIPPING THE STORESROOM

Function of the Storage Workers

We have seen that the work of storeskeeping is divided into two parts: the maintenance of the controlling stores records by the clerical workers, and the physical care and storing of the materials by the storage workers. This last group is responsible for the safe custody of all items shown on the stores records from the time they are turned into stores until withdrawn.

It is the duty of the storage personnel to keep all materials in their charge in perfect condition, accessible at all times, and stored in such a way that the work of receiving and delivering may be handled with the minimum of time and effort. These matters receive probably more attention in the majority of organizations than the work in connection with the recording and control routine, as it is self-evident that when stores are not carefully cared for, waste and loss are unavoidable.

Planning the Storesroom

If the storage group is to render maximum service, the convenient handling of materials within all sections of the storesrooms is a matter of first importance. To this end, the use of the entire space of the storesroom should be carefully allotted in detail to the different materials, with aisles laid out in such a way as to enable the clerks to find materials as easily as possible so that there may be no delay or loss of energy in movement to and fro. This involves two things: keeping every section of the storage space accessible, and the proper

placing of every item. Too much pains cannot be devoted to planning for the work to be done in an orderly and systematic manner if the final purpose—the immediate accessibility of every item—is to be fulfilled. In planning the arrangement and layout, several things should be kept in mind which for the sake of clearness are here enumerated:

1. Methods of placing and removing various classes of items should be reduced to standards. This requires uniformity of method both as regards stowing units of lots and the separating of lots so that the oldest may be used first.
2. The equipment should be flexible and interchangeable for varying conditions.
3. Every item should be properly placed. The location is governed by the difficulty of handling, the quantity in stock, the frequency of use, and various special considerations of perishability, safety, or similarity to the storage problem of other materials.
4. All goods should be clearly identified before being stowed. This includes a tag for every lot and a label for every unit or package.
5. All goods should be stowed in issuable units and placed to show the greatest possible number of individual units or packages.
6. Each item (and each lot whenever practicable) should be kept distinct and separate from every other item and lot.
7. The installation of proper equipment which will aid in handling items in a minimum of space, of time, and of effort.

Hours of labor and dollars of expense can be saved by intelligent consideration of the foregoing matters.

Where the storeskeeper has the planning of new storage areas, he will find it pays to observe the following sequence in making the layout:

1. The listing and classification of all items expected to be stored according to problems of:
 - (a) Measurements.

- (b) Difficulty of handling.
 - (c) Frequency of use.
 - (d) Special considerations, as of sensitiveness, perishability, or of peculiar similarity.
 - (e) Quantities to be carried.
2. Determination of ample storage space to be required.
 3. Determination of proper unit storage space.
 4. Determination of proper aisle spaces.
 5. Determination of proper location in relation to departments served.
 6. Determination of proper layout of storage and aisle space as related to general location of classes of items and area of total space available.
 7. Lastly, the planning of structures so that entrances, aisles, posts, platforms, windows, and other necessary features will not interfere with, but will facilitate the most desirable layout of the stores themselves.

Written Standard Practice Directions

These data, with the exception of course of the determination of the aisles and such spaces as are physically marked off, should be reduced to written standard instructions and, when supplemented with the procedure for handling the materials themselves, are complete instructions.

The importance of establishing in writing the standard methods of placing and removing the various items, and thus reducing their stowage to a system of rules, need not be emphasized. The effort to standardize procedure and practice forces attention upon the one best way to be followed until canceled or recalled. What is determined may be or may not be the best, but nevertheless the consistent following of even poor standards brings better final results than the haphazard and occasional following of the best of standards. The more completely a poor rule is observed, the more clearly will its failings be revealed, and the more readily will it be revised and corrected.

Location of the Storesroom

The provision made in the old-time concern for the physical care of material, more often than not, was far from adequate. The space set aside for the storesroom was usually any available space, perhaps merely a shed in an inconvenient location, dark and poorly cared for and ill adapted for any useful purpose. That kind of a storesroom has had its day. The modern factory manager has learned that it pays to provide carefully for the proper care of his stores. He considers the various features of location and the requirements of the building desired for the storesroom or the several rooms which may be needed in a large plant, where each kind of stores, whether general stores, component parts, finished product, or by-product stores, may be kept in distinct departments.

In the layout of a large plant the aim is to keep the movement of material in one direction and as nearly as possible in a straight line—from the raw material storesroom, through the manufacturing shops, the component parts storesroom, the assembly shops, the finished product storesroom, to the shipping department or whatever the final destination may be. This can be accomplished by placing the storesroom for each class of material closest to its delivery point. The economies secured by reducing the trucking from machine to machine and department to department while materials are in process have long been recognized. The storesroom usually should be near the delivery point in order that orders may be quickly filled and that the trucking problem may be as simple as possible. This is particularly true of all materials handled in small lots. It is simpler to truck large quantities of one material a long distance than it is to truck a large number of small quantities a short distance. Every yard of transportation and every minute of time which can be saved by the selection of the best available location is worth while. In addition to accessibility, other determining factors in location

are the nature of the material to be stored, and the length of time during which the material will be held in stores.

Size of the Storesroom

If conditions permit, the storage space should be large enough to care for all probable temporary increase from time to time in the amount of the stock. In nine cases out of ten the storesroom is skimped for space. Proper storage of all items often requires from 30% to 60% of the floor space devoted to the plant—the former figure, for instance, in machine shop practice, and the latter in a rolling mill.

The right amount of space in a well-planned stores layout is essential. More than this amount is wasteful, whereas less than this amount for each particular purpose leads inevitably to congestion, and congestion in storeskeeping is costly.

Storing Materials

The aisle arrangement governs the storage space. When shelving is used, 24 inches is a good depth for each side, or a total depth of 4 feet from aisle to aisle. When articles are placed upon the floor, 6 feet is a workable width for a row. Usually main aisles should be wide enough for the passing of trucks, whereas side or connecting aisles may be designed for one-way trucking only. Thirty inches is the standard width for aisles between bins or shelves where the contents are package goods handled by hand.

Just as important as the allotment of sufficient aisle space is the requirement that aisles be not obstructed by things left standing in them or by the projection of things stored along their margins. The delay caused by unexpectedly encountering a blocked aisle is always wasteful—likewise the danger of goods, projecting from their storage space, being damaged by passing trucks is obvious.

The inability to realize the necessity of ample space and the effect of inadequate provision is illustrated by the conditions in a rolling mill known to the writer. Scattered over the mill yard are nearly a half million dollars' worth of spare machine repair parts. Few parts are located near the machines they fit. No attempt has been made to keep each kind of part together, hence there are scores of duplications, with no records of quantities, values, or locations. Parts are exposed to the weather, except a small quantity stored on the floor of a building abandoned for productive work because water covers the floor after a heavy rain. The parts stored there are in about the same condition as those in the open, some of them showing $\frac{3}{8}$ inch of rust in the key-ways. Excavations for a new building uncovered many parts, completely buried under the soil. If these parts were put under proper control, the inventory could be reduced more than three-fifths. No machine would be shut down for hours while the replacement part was being found, and the deterioration and loss due to weathering would be omitted.

Storesrooms do not exist in this plant because the business has made so much profit that the management disregards these losses as inconsequential and that it is a useless expense to build the proper sheds to care for the parts.

Allotment of Space in the Storesroom

With accessibility constantly in mind, in making the layout the space set aside for storage should be divided into sections for the receiving, stowing, and delivering of materials. Once determined upon, these spaces should be reserved exclusively for the purpose to which they were allotted. It is well to have their outline marked or painted upon the floor or identified by some other striking method. Bins, shelves, or other fixtures define space limits. For open spaces, the more permanent and conspicuous the boundary lines are made, the better. In many

buildings, lines $\frac{3}{4}$ inches wide, of paint or of strips of bright metal tacked to the floor, have been used effectively.

The space set apart for the reception of materials need only be large enough for such sorting as is necessary preparatory to stowing in the proper section. This space may be distinct from the receiving and the inspection departments, and if no inspection of the material for quality and quantity is to be done on the storesroom floor, the room will be small. When stowing the material the clerk certifies on the material received report that the number of units called for have been stowed, after which he forwards the report to the stores record.

If there be more than one storesroom, the order for the material or parts should state the location of the room and the items should be moved to that place direct from the receiving department or the manufacturing shops, to reduce handling to a minimum. Thus the chief use of each receiving room will be the checking of quantity and the planning of its disposition in the storage space.

Where possible, the storage space should be located between the receiving and the delivery spaces. Ample space should also be allotted for packing and preparing materials for delivery. Individual packages from the various stowage spaces will be received here for making up into larger packages to be routed and delivered to the shops.

Aisles

Aisles should be perfectly straight and of sufficient size to fill all the requirements of moving and handling the material. Main aisles should conform to the direction of maximum travel. Sub or side aisles should be at right angles to main aisles. Usually and for preference, these side aisles should be at right angles to the source of light. If the room is wide, a center aisle is best with side aisles branching to each part of the storage space. If the room is narrow, a main aisle along one wall may

be better than a center aisle. But in general there should be a main aisle with the necessary side aisles branching off to all parts of the room.

The width of aisles should be planned according to their use and the size of conveyors and materials to be handled in them. The articles then must be placed so that the location in storage is known. A very simple arrangement is that of placing the articles by rows according to the symbol of the material. This method, however, entirely disregards the ease with which each material can be handled and is adaptable only to simple conditions of storage, such as when package goods are the only items handled.

Symbolizing the Storage Spaces

The better method for general application in practically all cases is to arrange the materials as conveniently as their bulk and use permit and to disregard the stores symbols. Each storage space should be symbolized for identification so as easily to locate the space. This symbol is to serve as the index of the material's location. Each row should be numbered in order, even numbers on one side of the main aisle, odd numbers on the other. Then each section of each row of bins or each yard of the rows of stacked material would also be numbered, beginning at the main aisle, odd numbers on one side of the aisle, even numbers on the other. Each tier in each section would be given a letter which would appear in the index between the two numerals. Thus "35A6" might represent the top tier of the sixth section in row 35.

Each storage space should have its location symbol painted upon it. The row symbol should be on the end of the row along the main aisles. Section symbols should be at the top and bottom of each section, while the proper tier symbol should be upon each partition between sections.

A chart of the entire layout and symbolization should be

drawn up and posted in a prominent place in the storesroom so that a new employee or other person unfamiliar with the scheme of symbolization may be able to find any item after a few minutes' study of the chart, if he knows the location symbol.

An index file of the location of each material, preferably of a visible type, should be hung in a prominent place. Only the material description, symbol, and location symbol need be noted. If, as described in Chapter VIII, standard definitions and symbols have been assigned to materials, the identification of each kind of material is simple.

Each storage space should also have indicated on it the symbol of the material stored therein. A small card held in a light metal frame of small size, such as $1\frac{1}{2} \times 5$ inches with edges turned over to prevent the card from falling out, serves the purpose.

Mechanical Aids

There are various mechanical aids for the rapid handling of material which should be used in every storesroom. Such are flexible bins, counting machines, trucks, etc. The requirements of such equipment are flexibility, adequacy as to character and strength, and permanence. In every manufacturing establishment, certain operations become so much a part of the common routine, so incidental to other operations, that their costs often escape notice and their efficiency is never questioned. The handling of material is decidedly such a problem. In the storage of material there are abundant opportunities for loss of time and of material, unless facilities are provided for taking care of the property in an economical and effective way. The best way is generally to dispense with man-power to the greatest possible extent.

In few live organizations are conditions the same year after year; in some the conditions change materially season by season. But a storesroom is built and equipped once and for all and is

then used every day perhaps for many years to come. Hence the importance of flexibility in the arrangement and the purchase of storage equipment as needed.

Standard Storage Units

The specific arrangement and construction of the various bins and racks depend upon the character and quantity of the goods. These factors also determine how the material is handled and transported, whether singly or in bundles, in barrels or tote-boxes, in barrows, trucks, or conveyors.

The determination of a standard rectangular storage unit such as a floor space of an area 4x3 feet, as the basis for the layout of the stores plant, is a great help in obtaining flexibility. Bins, platforms, and floor spaces can then be made to correspond to this unit of base area and so be interchangeable. Thus, without affecting in any way the general plan and layout, the particular equipment in use may be shifted to meet varying conditions. The same principle applies to the subdivision of bins and will lead to the adoption of a standard unit bin of such inside dimensions that it will hold a large variety of standard removable subdivisions.

Bin Subdivisions

The best shelving for bins is constructed of standardized steel parts which can be adjusted to form a storage space of any desired size and opening by the simple operation of bolting a few steel sheets and bars to a frame. All parts are standardized and interchangeable, easily and quickly erected or taken down. The stacks may be made up singly or arranged in series in rows. For instance, a bin, 24x24x24 inches inside, gives opportunity for a wide variety of subdivisions 24 inches deep whose other two dimensions will be even fractions of 24 inches.

The advantages of this shelving are many. Its mobility

and its convertibility into convenient receptacles for handling widely varying types of material, its great strength, its economical use of floor space, and the fact that it is fireproof and practically indestructible, make it especially desirable. It can be purchased in sections and added to as conditions require. Changes of location and arrangement are easy to accomplish with this standardized equipment, without serious interference with the necessary work of the storesroom and without the charges for labor and new material which inevitably follow alterations on wood construction.

Skids and Trucks

The basic idea back of the use of skids and elevating trucks is the separation of running gear and load platform and the utilization of a large number of detached wooden skids, which can readily be built in the carpenter shop. When the truck is rolled under a loaded skid, and the handle is thrust downward, the lifting bars raise the skid and its load off the floor, ready for hauling away. The skid and lifting bars remain locked in this elevated position until intentionally released. Then by the descent of the handle, the load is eased to the floor in its new position. The truck is pulled out from under the skid and is ready for another load.

The economy of keeping heavy and bulky materials—such as large size, flat paper or heavy castings—on skids to be moved from place to place by means of elevating trucks from the time they enter the plant until final disposal, is apparent. In addition, skids serve as platforms to keep the material off the floor, protecting it from dirt and from being easily bumped. The skid is also adaptable to many forms of convenient bins, racks, crates, containers, etc., reducing the number of time-consuming motions in handling material in storage and in process. The device also serves the purpose of a more expensive platform truck besides providing a means by which material

may be routed through the plant with little or no handling. Heavy goods when once placed on skids can remain there and be shifted from place to place with a minimum of handling.

Counting Machines

A counting machine which scientifically applies the principle of ratio weight in a simple machine of few parts which any ordinary laborer can operate and understand is a device of wide utility and economy in the storesroom. Such a device gives an accurate and quick count of any commodity, consisting of similar parts or pieces, without the use of tabulated figures of weights, mental calculations, or figuring of any kind. They are particularly adapted to the counting of goods of small size and in large quantity, such as papers, druggists' tablets, and small hardware. The total count of the contents of any box, barrel, bag, truck, or barrow containing an unknown number of like parts or pieces, can be determined accurately and almost instantly. There is no chance for confusion of figures, errors in estimates, or defective calculations, as the accuracy of the count is insured mechanically. Mental fallibility is eliminated and from 50% to 90% of time and mental labor is saved.

While a knowledge of the weight of the material handled is at no time a feature in obtaining count, yet whenever desired, weight and count may be secured in one operation.

Branch Storesrooms

Manufacturing conditions are sometimes such as to require the operation of "departmental stores" or "substores." Such substores are often opened in or near a consuming department for emergency use or to save trucking and handling, by withdrawing from the main storesroom a part of the stock on hand. This stock might pass under the physical control of the department which expects to use it, but preferably remains under the control of the central department.

CHAPTER XIV

STOWING MATERIAL

Definition of Stowage

Stowing, as everybody knows, is the act of putting things away in their proper places according to proper methods. Since, however, the method of stowing largely determines the facility with which things can be counted and removed, the term as used in storeskeeping includes the complementary work of removing and incidental handling.

The discussion of the art of stowing goods in a storesroom may seem to be devoting overmuch attention to elementary common-sense matters. Yet system and method in stowing is the foundation of orderliness and care in the handling of things and therefore the beginning of system and control in the storesroom. If methods are reduced to standards, and standard methods of stowing each class of goods are insisted upon and reduced to rules, the result will be such neatness and uniformity that inspection and counting will be greatly facilitated. The exceptions to good stowing, by their very conspicuousness, will then be easily noticed and corrected. Accordingly, it may be said that a good system once adopted will enforce itself by making violations immediately noticeable.

Where Goods Should Be Stowed

The arrangement of material within the storesroom needs consideration. The space should be divided into sections set aside for the storage of particular classes of materials. For example, separate spaces should be allotted for stowage of large castings or materials of awkward form, of materials

in large packing boxes, of small uniform materials easily kept in a system of bins or shelves, and a space for the temporary storing of unclassified materials. Within these spaces, the individual items are stowed in rows of stacks or of bins or shelves. As previously noted, these rows should be at right angles to the source of light if such an arrangement is practicable.

It should be a rule for goods to be stored only in the spaces reserved for the purpose. This means that window sills, ledges, floors, aisle spaces, etc., are not to be filled either permanently or temporarily with goods, unless the proper official authorizes the use of such space for that purpose.

The Double-Space Method

The maximum quantity or lot, ordinarily stowed at one time, should occupy not more than 75% of the space available if there is to be a reserve for times of special need. The ideal method, however, is the double-space system, by which double the space normally needed for the quantity of each item regularly received is set aside. This avoids the disadvantages of a separate storing place for surplus stock. The danger of separate storing—especially if the storeskeeper is responsible for the quantities on hand—is that some portions of items may be overlooked and a fresh supply ordered before it is really needed. On this account the allotment to each item of double the volume of an average lot received is well worth while where sufficient space is available. Such provision insures accuracy and simplicity in handling different lots because each may be kept separate so that the old lot always may be used first. It also results in less frequent need of locating stocks of any item in different places. Where the single-space method is used and a new lot comes in before the old is used up it is often necessary to put part, if not all, of the new lot somewhere else, there being no room in the space with the old lot. The double-

space system pays for itself in the savings in losses and spoilage. The less intelligent and careful the help, the more useful is the double-space system—it is more nearly “fool-proof.”

In stowing a bulky item of stores received in quantity, it should be a rule to concentrate it when possible. Thus two rows opposite each other (across a side aisle) should be filled in preference to two adjacent rows. Any excess over two full rows may then—if the storeskeeper so directs—be stowed in the aisle between. This saves space to almost the extent of solid block piling, yet preserves the flexible row arrangement with the maximum of accessibility. Side aisles may be used for stowing when the bins on either side are full of the same material. If that be insufficient, space in the main aisle adjoining a wall may be filled out even with full rows and aisles on either side of the same material.

Treatment of Special Items

The varying nature of the materials stored creates minor problems in stowing. With materials of small size or which are handled in small and infrequent lots, the storage problem is comparatively simple and uniform. With materials such as belting or lumber or other items of large size and awkward form, the problem becomes specialized. Belting, rope, and similar materials need to be stowed on reels for convenient handling. Inflammable materials, such as oil and gasoline, require special storage apart from the other storesrooms. In addition there are special considerations, such as the sensitiveness of explosives, the great weight of castings or pigstock, the perishability of foodstuffs, or peculiar form and similarity of shape, such as pipe and barstock, which would clearly point to the advantages of stowing those items together. Whether the location under those circumstances is most convenient is generally secondary to the particular equipment necessary for their proper care.

Common sense requires large, heavy items difficult to handle to be given the shortest possible haul. It is advisable, too, to stow items of great weight near the floor but above the platform height of the truck on which they will be moved. Similarly, items easy to handle but carried in large quantities and frequently issued should be in a convenient location near the main aisle and at a convenient height from the floor. It is convenient likewise to assign a central location close to measuring devices for items which when issued have to be specially measured, such as barstock, or oil in barrels. Again, it is economical in time to stow near each other items usually issued together.

The more frequent the occurrence of a storage problem, the more necessary it is to adjust conditions to meet the case. The receipt of an occasional lot of castings creates a special problem to the lumber dealer, just as a consignment of lumber may be a puzzle to the storage equipment of the machine tool manufacturer. If the storage of lumber is a regular thing in factory operation, the manufacturer could profitably visit a lumber yard and study the proper care of lumber, but storage of an occasional lot does not pay for the trouble and expense of securing special equipment and initiating special methods. Frequent and similar problems of storage lend themselves to standardized and definite methods.

In every storesroom some articles are for the exclusive use of certain departments. If the quantity used by one department justifies it, a branch storesroom should be established to serve that department but it should be directed by the general storeskeeper who should retain his responsibility for the operation of the substores.

Keeping Items Distinct

Great care should be taken that different items and different lots of the same kind of article be kept distinct. When requi-

sitions are being filled, the work is done as speedily as possible. Items of similar physical appearance or packed in similar cartons are easily mistaken for each other if not stored in separate spaces or bins. For instance, flat files and half-round files of the same size may be in cartons differing only in the description on the label. It would be easy for a clerk to pick up the wrong package if both kinds were stored in the same bin. If it is necessary to place several items in one space, they should be separated by a space of at least 1 inch if in bins, or three inches if on platforms.

Tools or equipment in regular use in storesrooms will be provided with special places, marked so as to show the purpose for which they are reserved.

Identifying the Materials

The ideal method of designating material would be not only to label each lot and package temporarily, but in such a way as would also identify individual items after separation from the lot. This is desirable sometimes because from time to time it becomes necessary to know the origin and past history of a lot or of some part of it. Not every article can be identified by a label attached thereto, but many can be, and every package can be labeled or marked. Such labels should give the standard definition of the material, its symbol, and the number of units contained therein. Other obvious details not always attended to are that identification marks on packages when stowed should preferably face out, or be conspicuous. Therefore the end of the package is usually the best place for labeling, so that when stacked the largest number of labels will show, furnishing a check against packages being misplaced.

The Bin Tag

A useful means of identification and a supplementary control record is a tag attached to each lot. Usually known as

[illegible]

PAGE

[illegible]

REVERSE

quantity received. It is sent with the material to the storage space and kept with that material at all times. A convenient way to prevent it from becoming lost after the material is stowed is to have a metal holder attached to the inside of the bin or located in some accessible, nearby place.

The bin tag is operated in the same way as a stores ledger card. Before each requisition for material is filled, the amount issued is subtracted from the quantity shown on hand and the balance is brought down. The symbol to which the material is to be charged is entered in the right-hand column as a reference of the transaction. Conversely, if any material is returned on a stores return, it is added to the balance on hand when placed in the bin.

When a bin tag is filled with entries, the quantity in the storage space is inventoried and that amount is entered on the tag as a check on the last balance shown. The heading and the amount on hand are filled in on a new tag and the old one is sent to the stores record for checking. When a lot is exhausted, the tag is also forwarded for checking.

Surplus Stock

Sometimes a bin proves too small for the amount of material allotted to it, and the surplus stock has to be placed elsewhere, perhaps in a distant storesroom. The second location should be indexed by means of the surplus stock tag (Form 30) placed in the bin tag holder. This tag indicates the whereabouts of the extra stock and the quantity there to be found. The material in the bin itself should be the oldest lot, and the bin should not be refilled until that stock is exhausted.

While the various locations of surplus stocks are readily designated in the way described above, the storage of similar lots in two places is a practice which has nothing to recommend it and everything against it. Much the better way is to provide ample space for the storage of lots of all sizes in one location.

Rules for Good Piling

It may seem elementary to state that articles should never be placed in a position which might cause injury to them, yet not all stores clerks remember that sheets of paper should lie

<p>KEEP THIS TAG ATTACHED TO BIN TAG IN REGULAR STOCK</p> <p style="text-align: center;">○</p> <p>SURPLUS STOCK</p> <p style="text-align: center;">OF</p>	
STORES SYMBOL	
DESCRIPTION	
<p style="text-align: center;">LOCATED IN</p>	
<p>KEEP THIS TAG ATTACHED TO BIN TAG IN REGULAR STOCK</p>	

[illegible]

REVEREND

Form 30. Surplus Stock Tag (red). (Size 2 $\frac{5}{8}$ x 5 $\frac{1}{2}$.)

The rules of good storage demand that goods be placed all one way unless for stability it is desirable to reverse the direction or to cross-pile. *Reversing* should be done singly or in groups, according as the goods are piled singly or in groups, the same dimensions, however, lying the same way. *Cross-*

piling, or laying goods in each tier or course at right angles to those just below, while increasing stability, decreases accessibility and sureness of count. As stability is generally less vital than accessibility and flexibility, cross-piling should be resorted to only in special cases.

In general, the best way for goods to lie is with their ends out towards the aisle into which they will be withdrawn, unless space can be economized to a marked degree by placing the goods in some other way. Labels or other means of identification should be placed all one way showing outward, whenever possible, for ease of inspection. Articles with defective wrapping should be placed last, in order that they may be removed first. The person stowing goods should be made responsible for seeing that the tying or wrapping of packages is in as good condition as his facilities permit. This includes the putting on of new wrappings when necessary and feasible.

The Unit of Stowage

A thing which takes time when issuing material is the necessity of measuring or counting the quantity of material wanted each time a requisition is being filled. Not that such measuring is unimportant, for it is necessary, but a large part of the articles stored can be made into packages containing the usual quantity issued at one time. This requires goods to be stowed as often as possible in the units in which they will be issued, even though this necessitates the breaking of units in which received. The time element, however, is less important when goods are received than when they are needed for delivery, and many similar packages may be made up at one time with less time and effort than the same quantity handled singly.

Piling

In the area to be filled, such as a platform space or a bin, *stowing should begin at the back left-hand corner, and carried*

on vertically until one column is completed. Thus the first of a row of such columns is brought to the front and completed before a new row is started. The second row of columns begins as did the first, in the farthest left-hand corner of the remaining available space, and is built up or tiered, in the same manner.

Where economy of space is less important than economy of time and effort, goods should be tiered only as high as an ordinary man can reach. Five feet to the top of the next to last tier is a normal height for packages not exceeding 100 pounds. Where it is possible to choose between cubical and pyramidal piling of goods, the cubical method is to be preferred, because stocks are then easier to inspect and count and because of economy of floor space. The only advantage of pyramidal piling is that it is then simpler and easier to secure stable tiering of cylindrical or other rolling articles, such as cans, by bracing the bottom tier only of each stack.

Counting

For convenience in counting it is a rule of good storage for full columns, stacks, and blocks of any one item to be kept uniform for that item. Only the last column, stack or block may remain incomplete and contain odd quantities. Besides being an aid in handling and making carelessness more noticeable, such uniformity greatly facilitates the accuracy and speed of inspection. So far as possible, stores should indicate their own count. Hence the importance of uniformly regular columns, stacks, and blocks. This is the chief reason for preferring cubical to pyramidal piling. While the quantity in a full pyramid is easily calculated by mathematical formula (quantity in a full stack equals the product of the number on the bottom tier times the number of tiers plus one divided by two) difficulties arise as soon as a portion of the pyramid is removed. It should not be necessary to count each article to

find out how many are left. Piling in uniformly regular columns, stacks, and blocks, with only one last column, stack, or block containing an odd quantity, is the obvious solution of the problem of easy count.

For the same reason, the use of easily calculated decimal units for the quantities in blocks, stacks, columns, and sometimes packages, is desirable. Packages and single articles may be piled singly if there are not more than ten, but otherwise only in multiples of five. Beyond this the columns are made as high as the space will permit but of whole groups of five only. Groups are not broken to fill in a space too small for a whole group. Thus every column of articles small enough to be piled in groups of five will contain some multiple of five and will be uniform for that article. For instance, if a bin holds 24 packages of letterheads piled snug to the top, the column should be made up of 20 packages only, viz., four groups of five each.

Removing Goods

The rules as to the removal of goods should state that when more than one lot of any item is on hand, the lots are to be drawn upon and exhausted in the order of their age, commencing with the oldest unless a particular reason exists for changing the practice in the case of an individual issue. Of any one lot, the last goods to be put in place are to be removed first. Further removals are continued in that order—the reverse to that in which they are placed. Clerks should also be instructed that where goods have been concentrated by stowage in side or in main aisles between previously filled rows, removal must be made first from the aisle spaces. No goods must be removed from a regular row until all adjoining aisle spaces have been entirely cleared. In like manner, incomplete columns, stacks, and blocks should be exhausted before complete ones.

In removing goods from storage in a pyramidal or a cubical

block, the instructions should be for removals to be made stack by stack from the front—the reverse order in which piled. Thus there will be but one incomplete stack at any one time, all stacks behind the front one being complete. Removals from any one stack should be tier by tier from the top, so as not to disturb existing stability or to weaken any brace at the bottom tier.

Change of Location

Whenever the main location of an item is changed, notice should be given to the stores records clerk so that the proper

STORES SYMBOL		QUANTITY OF UNITS INVOLVED	
		QUANTITY	UNIT
NOTICE TO STORES RECORDS DEPARTMENT OF THE CHANGE OF LOCATION OF THE STOCK DESCRIBED BELOW			
FROM		TO	
OLD LOCATION		NEW LOCATION	
SIGNED		DATE	NEW BIN TAGS MADE OUT BY
			STORES RECORD CHANGED BY
STORES RECORD			

Form 31. Notice of Change of Location of Material. (Size 5 x 3.)

location may be stated on the stores records and on the subsequent requisitions to be filled. Form 31, notice of change of location, serves that purpose. Made out and signed by the storeskeeper who makes the change, it is sent to the stores records clerk and the new location noted on the stores ledger sheet. When the change is being made, the stock can be inventoried and the old bin tag checked with the stores records. A new tag records the inventory and continues the service

begun by the old. Form 31 may also be used when reporting the location of new material received for the first time.

Verifying Inventories

For the verification of the inventories, if the number of items warrant the specialization, a special clerk should be appointed to do nothing but count the quantities for comparison with the records. If an employee cannot be profitably occupied with this work, it should be a part of the regular duties of the storesroom attendant. In the course of a year such a verification should cover every item once at least, and it is better to complete the cycle every six months. When this is done it is unnecessary to shut down the plant specially for the purpose of taking inventory.

The Delivery System


Various methods are employed for the delivery of stores to shops and offices, ranging from the practice of a foreman sending the office boy or a workman or going himself to the storesroom whenever anything is required, to the handing over of all deliveries to the storesroom on the mail-order plan. This last method is preferable for various reasons:

1. It compels the various departments to determine their wants in advance.
2. It saves the time of employees making a long trip and possibly waiting in line at the storesroom to receive a small item.
3. It enables the storeskeepers to work uninterruptedly without confusion.

Under this plan a stores clerk is able to take a dozen or more requisitions for one material or for materials located together and fill all requisitions at or near one place. When the items called for are sorted in the delivery room, the deliveries to departments can be planned for at the same time, thus

making one delivery serve the purpose of half a dozen or more. This plan results in such a material gain in the speed of filling requisitions that it cuts down the work of delivery clerks by at least one-half.

The mail-order delivery method requires a department, as soon as the need for a material is determined, to forward a stores requisition to the storage department. The first thing the storage department does is to make out a move tag illustrated on Form 32. This tag is perforated into two parts and both parts show the symbol of the material, the charge, and the point to which the material is to be moved. The coupon also provides a space for the signature of the person receiving the material from the delivery man. The tag is first attached to the requisition until the material is taken from the bin, when it is attached to the removed material. Form 48 (page 231) can also be used as a move card for delivering the material. If the material is not required at once, the requisition should be filed in a tickler file until the day previous to the delivery date.

DELIVER TO		DELIVERY POINT
		
DEPT.		
MATERIAL SYMBOL		
QUANTITY AND UNIT		
DESCRIPTION		
CHARGED TO		
FROM	TAG NO.	
	9763	
MATERIAL SYMBOL	9763	
QUANTITY AND UNIT		
DESCRIPTION		
CHARGED TO		
DELIVERED TO	DATE	DELIVERY POINT
RECEIVED BY		

Form 32. Stores Delivery Tag.
(Size 2 $\frac{3}{8}$ x 4 $\frac{3}{4}$.)

Procedure in Filling Requisitions

The first work of the storesroom in filling a requisition is to ascertain the location of the material if not stated on the

requisition, and, before removing the material from its storage space, to deduct the quantity wanted from the balance shown on the bin tag. When the entry is made, the proper amount of material from the oldest lot is removed, and the clerk initials the requisition as proof of the issue of the material deducted from the bin tag. The requisition is then forwarded to the stores record for making the entries thereon.

If there is not sufficient material on hand to fill the amount required by the requisition, a supplementary requisition for the balance undelivered is made out by the stores clerk, and kept until a new stock of material is received. In this case, the entry on the original requisition is changed to show the actual amount issued.

In the delivery room the move tag is securely attached to the outside of the package. When the trucker delivers it, he obtains the signature of the recipient on the coupon, which is returned to the stores department for filing by serial number for a few days for reference in case of dispute of delivery. The stub remains attached to the package or the stores items for purposes of identification until the articles are required for use in the factory. The foregoing procedure of course is applicable only to conditions in a large plant.

CHAPTER XV

TAKING INVENTORIES

Steps in Establishing Materials Control

Although the theory and methods of maintaining materials control and the workings of the stores system have been discussed in detail in the preceding chapters, the steps to be taken in establishing this control have not been stated. A most careful procedure is required for both the concern which has had some materials control and the concern which has had none. The steps to be taken in establishing adequate control are as follows :

1. The conditions to be fulfilled by the control mechanism must be thoroughly analyzed so that the problems may be clearly recognized.
2. The various methods of control must be studied so as to fit the system to the conditions. The system chosen and its details must be written up in manual form so that it may be permanently established and understood by all concerned.
3. A control organization must be organized, and the members drilled and trained in the duties which they are to perform.
4. Records, requisitions, receiving reports, credits, and other stores forms must be prepared and issued to all parties who are to use them.
5. The records, with headings properly filled in, must be made ready for entry of the details to be gathered together from various sources or to be compiled for the first time.
6. A physical inventory must be taken in order that the initial quantities to be entered on the stores records as being on hand, on order, and so on, may be accurate.

In preceding chapters the methods of handling each step

have been detailed, except the last—the taking of physical inventories.

Necessity for Taking Inventory

Inventories always have been and always will be taken in every concern regardless of the particular system of materials control in use, or whether any at all is in operation, because an inventory must be taken at least once a year, at the end of the fiscal period, in order to compile the annual balance sheet and profit and loss statement. These two statements, of course, are necessary to show the financial results of the business for the period and for tax purposes.

While the term "inventory-taking" usually is understood to mean the taking of a physical inventory or the counting and listing of every item to be included, the term frequently is intended to mean "book inventories," which is the totaling of the items shown by the stores records to be on hand.

In an earlier chapter the reasons for securing monthly financial statements were given and it was stated that unless a perpetual inventory or stores record is maintained, a physical inventory is required as often as the statements are prepared. If a complete accounting and cost system, including stores control as described, is operated, the materials control account values are known at all times by virtue of the stores routine. If a complete system is not operated but stores control is, then a periodic book inventory furnishes adequate inventory values of materials in stores but not in process. The latter must be found by actual count or from adequate production control records such as are described in Chapter X and in Part III.

Physical Inventory

The advantage of the stores record in connection with this work is easily seen. However, even though a perpetual inven-

tory is kept, physical inventories should be taken from time to time to check the perpetual inventory and the material control accounts in the general ledger.

Taking a physical inventory usually has been a matter to be dreaded and hurriedly completed—the more quickly completed, the better—with correspondingly inaccurate and unsatisfactory results. After the stores records have been started, the work involved in a physical inventory can be distributed by counting, weighing, or measuring a few items daily or weekly until each item in the entire storesroom has been inventoried and checked, perhaps several times during the year. Besides, counts can be made of specific articles upon the request of the control clerks now and then, such as when an item is to be reordered. Several other methods have been described in previous chapters.

Whenever discrepancies are located between the book amount and the physical count, they must be immediately corrected, as stated in Chapter V. If the physical count shows less on hand than the record, a regularly approved requisition is used to credit the materials account and to charge the "Loss in Inventory Adjustment" account for the quantity and value involved. If the count shows more on hand, a stores credit is used with the opposite debit and credit. The inventory adjustment account should be carried directly into the general profit and loss account.

Advantages of Regular Checking Counts

Because of this systematic round of counting, and such correcting as is necessary, the inventory records can be relied upon with assurance at all times. Accurate book inventories may be taken quite frequently to check the control accounts as inventory-taking then consists in merely taking an adding machine list of the balances.

In fact after the perpetual inventory has been in operation

a sufficient length of time that reliance may be placed in its figures, if regular checking counts are made of the stores-room, and suitable production progress records are kept, a book inventory is adequate for most concerns for making up any financial statements; and the complete physical inventory with its attendant shutdown may be eliminated.

The further advantages of this method of inventorying can be readily seen, if it is realized that every plant closing one week for inventory loses 2% of its entire productive capacity, and during this period, fixed charges are continuing just as high as though the plant were in operation. Plants suspending for periods longer than one week for inventory lose a proportionally greater percentage of capacity. Furthermore, the organization will be found less efficient upon reopening.

The Duplicate Tag Method of Taking an Inventory

In some plants it is almost impossible to take a physical inventory of material in process for checking of records while the plant is in operation. In such cases and in others, such as upon the starting of the materials control system, the taking of a complete inventory will be usually regarded as something to be completed in haste because of its distastefulness. Furthermore, in many cases an inventory is regarded of relative slight importance and the work will not be planned and co-ordinated. Few inventories are accurately taken. When this fact is recognized, the responsible authority often orders the work to be repeated, thus lengthening the total time and increasing the distastefulness and expense.

This unpleasantness is unnecessary. The method to be described eliminates that unpleasantness and makes inventory-taking no more difficult than, and as accurate as, any clerical routine. This method known as the "duplicate tag method" of taking inventory is based upon the careful planning of all details involved in the work.

Preparations for Inventory

Preparations should be begun long before the inventory time and carefully explained to every party who is to be concerned with the task. The work for each department is carefully laid out, and then each person in that department is assigned a definite job, instructed in it, and told under whose direction he will act. When these instructions and methods have been learned and used, it is of great advantage to continue to use them year after year, or until such time as a better method is evolved and substituted; thus it becomes a matter of habit and everybody is able to do a better and quicker job because of the experience of the previous year or years.

The steps in this method are as follows:

1. Writing and issuing the inventory instructions.
2. Making ready the inventory tags.
3. Counting, weighing, and measuring the inventory.
4. Comparing the inventory with the records.
5. Pricing the inventory tags.
6. Extending the inventory tag values.
7. Listing the inventory.
8. Totaling and comparing the inventory with the control account.

Inventory Instructions

The inventory instructions should be worded clearly, type-written or printed, and issued in sufficient time that they may be thoroughly understood by all parties receiving copies. Provided there is a sufficient number to be engaged in the inventory work, it may even be advantageous to conduct a school for their instruction. This usually is necessary only during the first use of this set of instructions.

Inventory instructions should be written in such a way that each party receiving a copy may have a complete story of what his work is to consist and how it ties in with the inventory as a whole. This can best be done by grouping the

special instructions for each department separately, following the narration of the general instruction applying to all departments. These general instructions pertain to—

1. The length of the inventory period.
2. The personnel to take the inventory.
3. The articles to be inventoried.
4. Special departmental instructions and preparations.
5. The details of how to make the count.

Inventory Period

The inventory period should be as short as possible. While it is important that the starting and finishing dates be clearly defined it is most important that the "as of" date be thoroughly understood by all. The work can be done in some departments in a day or two easily while in others it may require a week or more, depending upon the amount of work to be done. In the latter case, additional workers should be used to shorten the necessary time.

Each department should cease all operations, so that no confusion may be caused to those doing the work. Where the production of a department is absolutely required for current work, special pains should be taken to complete the department's inventory, so as to resume operations at the earliest possible time. If necessary, inventory can be taken without the department shutting down; but it is not desirable. Naturally, storesrooms present little difficulty in this respect.

Directing and Taking the Inventory

Any work, to be successful, should be under the exclusive direction of some responsible party; taking inventory is no exception. Ordinarily the financial interest in the inventory-taking is the strongest. Accordingly, the controller or corresponding executive is usually the supervising authority in charge. He should have assisting him, as the active members

of the inventory personnel, the various department heads, such as the control manager, materials supervisor, general storekeeper, general superintendent, and the various foremen and other department heads and supervisors—both of the factory and the facilitating departments, such as the accounting, purchasing, shipping, receiving, and so on. In fact, inventory is a matter affecting every department of an organization; and each department head should be thoroughly drilled in his responsibilities so that no department may fail in its part of the work.

For the active inventory work of counting, measuring, and so on, foremen or other responsible heads pick their shop clerks, inspectors, and members of their departments who are most familiar with the material to be taken and who can be relied upon for accuracy and thoroughness. Clerical departments, such as the purchasing department, assign their duties to members performing routine work most closely related to the inventory details.

Classification of Items to be Inventoried

The instructions should clearly define and locate what is to be inventoried, under such broad classifications as general stores, finished products, work in process, and so on. Further definition may be made of the specific items or classes of items within each general classification. Usually only materials will be inventoried, as it is unusual to inventory fixed assets, such as machinery, furniture, and equipment, since their records are subject to only occasional error. The inventorying of these fixed assets usually consists of checking the plant investment records against the equipment located in each department.

Special Instructions for Departments

Each department's special instructions and preparations should be carefully defined so that each may have a definite

task and every detail may be definitely assigned to some department. The duties of the various departments are as follows:

RECEIVING DEPARTMENT. The receiving department is to clear its floors of all goods received up to the inventory "as of" date. Receiving reports covering such goods are to be completed and quickly forwarded to the materials control department, while the goods are forwarded to the storesroom to be included in their count. Goods received after the inventory "as of" date are to be kept in the receiving room but are not to be confused or included in the inventory. However, they may be unpacked and the reports made out ready for the resumption of routine.

MATERIALS CONTROL DEPARTMENT. The materials control department is to clear up all clerical work connected with requisitions, credits, receiving reports, and other stores forms, so that the records may be up to date. All forms must be forwarded to the proper departments for them to complete their work. The department must be prepared and ready for comparing and pricing the inventory reports when received from the inventory-takers.

STORESROOM DEPARTMENT. The storesroom department is ordered to clean up, to sort and stack its material, and to place all articles in proper receptacles, marked so as to be readily identified, and any requisitions, credits, and so on, promptly forwarded. Scrap and obsolete material is weeded out and sent to the salvage department. In other words, the department is to make certain that all materials are stowed in accordance with standard practice. Deliveries from storesroom to factory should cease or slow down several days prior to inventorying.

During the inventory period this department inventories on inventory tags, as described later, all the materials in the storesrooms.

MANUFACTURING DEPARTMENTS. The manufacturing de-

partments must clean up all spoiled, defective, or scrap materials in process, repairing what can be repaired and forwarding the rest to the salvage department; sort and bring together all like job numbers; put all articles in proper receptacles; complete all jobs which can be completed; and bring all work in process which cannot be completed as near completion as possible. In short, the manufacturing departments make a general "house-cleaning," by which the amount of material on the floors is minimized. Manufacturing departments should minimize requests for materials during the days immediately preceding the beginning of the inventory period, because each item on the floors at inventory time must be covered by an inventory tag.

INSPECTION DEPARTMENT. The inspection department inspects and forwards before the "as of" date all materials in the inspection cribs and in process, in order that the stage of completion of all materials in the manufacturing departments may be officially determined.

SALVAGE DEPARTMENT. The salvage department must classify all materials in its possession according to condition, before making out inventory tags. Material which cannot be corrected is sent to the scrap storehouses ready for resale. If scrap can be corrected, it is retained in the salvage department until inventory is completed, when it is transported to the proper department for correction.

PURCHASING DEPARTMENT. The purchasing department is urged to minimize the amount of material received during the inventory period, and to restrict to bare necessities the material to be received prior to inventory time. The department draws up a list of unfilled purchase orders and contracts, arranged according to part numbers or names of material, as of the inventory date, for the materials control department to check the "on order" section of the stores records. Outside concerns which have in their possession certain materials, tools, patterns,

etc., belonging to the company which is making the inventory, are requested to submit statements covering such articles. They may be also requested to furnish a list of the above assets which have been shipped back to the company a certain number of days prior to the inventory date, so that any items in transit may be determined.

There must be a complete agreement and understanding between the purchasing department and the general accounting department regarding vendors' invoices. All invoices for goods received before the inventory "as of" date must be recorded and charged to the materials control accounts as the goods will be inventoried.

If sellers' invoices have not come in, memorandum invoices are made out by the purchasing department and sent to the accounting department for goods received in stores. Goods covered by invoices passed for payment prior to the inventory date and recorded on the books are considered as a part of the inventory even though not yet received. All purchase invoices in dispute are promptly adjusted with vendors and sent to the accounting department for entry. All invoices which have been received for goods still in transit should be segregated and listed separately. These may or may not be taken into inventory, but it is sometimes good practice to do so, as goods shipped f.o.b. seller's works are technically the property of the buyer.

SALES DEPARTMENT. The sales department furnishes the accounting department with a list of all products billed but unshipped, and of all products shipped but not billed prior to the inventory date. Proper adjustments in the inventory "totals" must be made by the accounting department for these amounts.

GENERAL ACCOUNTING DEPARTMENT. The general accounting department must have its routine work strictly up to date, together with calculations of proper amounts by which

the inventory totals as taken from the inventory tags are to be adjusted. These amounts are those just discussed, the value of products billed but unshipped, and so on.

If the general accounting department supervises the taking of inventory, it will control all inventory tags and sheets. Acting in this capacity, it will charge the tag-writers with the tags and sheets as issued and credit them with returns. The fact that tags are serially numbered helps the general accounting department to keep its records straight.

When inventory has been taken, tags are returned to this department. Then they are checked by serial numbers, and are forwarded for pricing either to the cost accounting department for work in process, or to the materials control department for materials in stores.

After being priced and compared with the records, the tags are again received by the general accounting department for extension and listing on the inventory sheets. The sheets are then totaled by controls, adjustments recorded, and retotaled ready for the final comparison with the control accounts in the general ledger.

COST ACCOUNTING DEPARTMENT. The tags which the cost department receives from the general accounting department are matched with the work in process records for comparing the inventory quantity with the record quantity and for pricing the tags. To reckon prices quickly, the cost files must be up to date. More is said of this later.

Inventory Tags

The employees who are to perform the actual counting, measuring, and weighing of the inventory, should work in teams—one member to write the inventory tags, the other to supply the information. Each must be thoroughly familiar with the general methods in use and any peculiar conditions and instructions for the department he covers.

INVENTORY COUNTERS TAG	○	NO. _____
PART NO. (OR SKS) _____		
NAME _____		
MATERIAL & SUPPLIES		
INVENTORY COUNTERS TAG		NO. _____
PART NO. (OR SKS) _____		
NAME _____		
DESCRIPTION _____		
DEPT. _____	SEC. _____	BN. _____
UNIT OF COUNT _____		
FIRST COUNT _____	MADE BY _____	
CHECKED BY _____		

IN	IN	IN	TOTAL

STORES RECORD QUANTITY			
PHYSICAL COUNT		UNIT COST	INVENTORY VALUE
REPORTED	ACCEPTED		

INVENTORY COUNTERS TAG	○	NO. _____
DEPT. _____ SEC. _____ BN. _____		
MADE OUT BY _____		

[illegible]

of the data on the tags is self-explanatory. Forms 33 and 34 are practically alike. Provision is made for the movement of material "in" and "out" of stores after the first count is made, which may be several days before the inventory date. Form 35 for work in process needs slight explanation. When all pieces of the lot of material being inventoried have not

INVENTORY COUNTER'S TAG		NO. _____	
PART NO. _____			
NAME _____			
FINISHED PRODUCT OR COMPONENT PARTS			
INVENTORY COUNTER'S TAG		NO. _____	
PART NO. _____			
NAME _____			
DESCRIPTION _____			
DEPT. _____		BIN _____	
FIRST COUNT _____		MADE BY _____	
CHECKED BY _____			

IN	IN	IN	TOTAL

STORES RECORD QUANTITY			
PHYSICAL COUNT		UNIT COST	INVENTORY VALUE
REPORTED	ACCEPTED		

INVENTORY COUNTER'S TAG		NO. _____	
DEPT. _____		BIN _____	
MADE OUT BY _____			

[illegible]

on the work in process being inventoried are known, it is sufficient to enter in the designated space only the number and name of the last operation. This shows the condition of the work in process. If the sequence of operation is not known, however, it is necessary to count the number of pieces of work in process completed on each operation and to show in detail

the operations completed on that batch. Tag-writers should be sufficiently acquainted with the material being inventoried

as to be able to recognize it and know its stages of completion so that all details may be properly described.

INVENTORY COUNTER'S TAG		NO. _____	
PART NO. _____			
NAME _____			
WORK IN PROCESS			
INVENTORY COUNTER'S TAG		NO. _____	
ORDER NO. _____		DEPT. _____	
PART NO. _____			
NAME _____			
DESCRIPTION _____			
CONDITION (NO. & NAME OF LAST OPERATION)			
UNIT OF COUNT _____			
FIRST COUNT _____			
CHECKED BY _____			
MATERIAL			
PHYSICAL COUNT		UNIT COST	VALUE
REPORTED	ACCEPTED		
LABOR AND BURDEN			
LABOR	BURDEN		
	HOURS	RATE	AMOUNT
INVENTORY COUNTER'S TAG		NO. _____	
DEPT. _____		LOCATION _____	
MADE OUT BY _____			

Form 35. Inventory Tag for Work in Process. (Size $3\frac{1}{8} \times 7\frac{1}{4}$.)

the count is secured, it is written upon the tag by the tag-writer.

The tags are perforated into three sections and are arranged with wires for attachment to the material. The necessary entries are made on all three sections. As each lot of material is inventoried, one tag is attached by the tag-writer to the lot and the bottom stub is torn off and sent to the supervising

Filling in the Tags

A supply of the inventory tags is issued to each team of inventory-takers by the accounting department. When issued, each tag contains a serial number only. At the starting signal the workers in the charge of foremen or department heads commence to count, weigh, measure, or size the inventory items. The count, weight, etc., should be reckoned twice before the tags are filled out. The "unit of count" may be the pound, the barrel, piece, etc., but preferably is the same as the unit of issue. As

authority. If a receptacle is empty, a tag marked "empty" is placed upon it. Every tag should be accounted for—none should be lost, destroyed, or borrowed. Spoiled tags should be marked "void" and sent to the supervising authority.

Supervising and Comparing Inventory

As soon as inventory is completed in each department, the supervising authority is notified. His representative visits the department to see if everything has been inventoried. If so, tag-writers and others who have been working there are released and are assigned, if necessary, to other departments. The next step in inventorying is to pull—or detach—the main part of the tags, leaving the top section or stub attached to the goods. No tags are pulled without the approval of the supervising authority. After the tags have been pulled in a department, regular operations may be resumed, provided they do not interfere with inventory work in other departments. Tags pulled are sent to the supervising authority and compared with duplicate tags. If all tags are not accounted for, search is immediately made for the missing ones.

After the tags have been pulled, they are sorted according to the material classifications and forwarded to the cost department or the materials control department for comparison with the records and for pricing. The handling of the two classes of tags is similar. The work in process tags are then arranged in the sequence of the work in process ledger files, and the materials and product tags in the stores records sequence.

As quickly as possible the quantities shown by the tags are compared with the quantities which should have been found by the inventory counters as shown by the records. If the difference is large enough to warrant, a recount is immediately requested before the materials can be moved or changed in form, the recount being made by someone other than the person who took the original inventory.

Pricing Inventory Items

At the same time as the quantities are compared, the unit value of the material should be entered on the tag. The inventory price may be either cost or market, whichever is lower. Stores materials are easily priced from the stores records, as are requisitions (see Chapter V), except when starting the materials control system or when the market price is to be used. When starting the system, the price must be taken from whatever records are most convenient or reliable—purchasing department records, accounting department records, market quotations, or estimates of the engineers. As a rule the market price is only used when it is lower than cost price, as during a period of falling prices, in order to wipe out during the current period a loss due to poor purchasing policies. If any price is used other than the stores record price, suitable change must be made on the stores record in order that future transactions may be priced at that value.

In Chapter X on "The Costing of Orders," the elements to be included in costs of production are fully explained. This cost is to be used in pricing the work in process tags. In most cases it will mean reckoning the total of the time cards, requisitions, and other cost papers which, if the costs are handled as described in Chapter X, the preferable method, are filed by order number.

Final Steps

When the tags are all priced, they are returned to the accounting department for extension, which should be done twice to insure accuracy. They are then arranged by materials control account, by serial number, and under the direction of the supervising authority are listed upon the inventory record sheets (Forms 36 and 37).

These records are then added, the necessary adjustments entered as described above, and the net totals compared with

[illegible]

Form 36. Inventory Record for All Materials in Stores. (Size 14 x 11.)

[illegible]

Form 37. Inventory Record for Work in Process. (Size 14 x 11.)

the ledger accounts. Differences are journalized to Profit and Loss.

This completes the description of taking inventories—a not unpleasant job when carefully planned and co-ordinated by a supervising authority who realizes its importance and the importance of planning before acting.

CHAPTER XVI

ORGANIZATION OF THE MATERIALS CONTROL DEPARTMENT

Summary of Responsibility

While the work incident to the control of materials has been discussed in detail, so far little has been said about the internal organization of the department responsible for its performance. The functions to be performed may be reviewed before taking up the discussion of the organization which performs them.

The function of control may be summarized in the five steps of :

1. Determining the probable materials requirements.
2. Securing and storing an adequate supply.
3. Issuing and delivering stores as wanted.
4. Recording all stores transactions on suitable records.
5. Furnishing the data for cost and financial accounting relating to stores.

This enumeration summarizes in skeleton form the entire function of materials control, in which is centralized the scattered efforts which the several departments of the organization may have been making to control materials.

Relation of Storeskeeping to Other Functions

As developed in previous chapters, the storeskeeping function occupies a position of service in the organization of the business as a whole, equal to the personnel or the inspection functions. Like them, it should be responsible to the head of the manufacturing organization, as the production departments'

results depend to a large extent upon the furnishing, when and as wanted, of the materials required in production.

Relations with a Production Control Department

As discussed in Chapter II, the stores records are a part of the production organization's tools. The materials control department should become a part of the production control department in any concern having a real production control department. Such concerns at present are few in number, but they are growing, since complete production control is of vital importance to production success. This will be appreciated more fully after the study of Part III, and the reader will see what work is added to materials control to form a complete production control department.

Co-operation between the Storeskeeping Groups

The two distinct phases to the task of storeskeeping—the clerical and the physical—demand different qualifications of the employees. The clerks handling the stores records check the storage clerks, recording what they have done and should do. At the same time the second group, although its work is largely physical, has its records necessary for its own information in performing its work and which at the same time serve as a check on the purely clerical group.

Co-operation between the two groups can be obtained through friendly rivalry and mutual assistance in the difficulties which arise in the ordinary routine work—and difficulties occur frequently enough. It is best, especially in a high-speed concern, to have the two groups under the same head, so long as he is trustworthy and reliable and capable of keeping the two kinds of work distinct and separate and at a high state of efficiency while securing the necessary co-operation.

In a large concern each kind of work will require a sufficient number of employees and space to make an easily

administered force, and the securing of a specialist to head each of the two kinds of work will not be a useless expenditure of money. Even in a small concern, it is almost necessary for efficient administration to have a "general storeskeeper" responsible for the storage group to the materials control supervisor, while the materials control supervisor continues as the active head of the clerical group.

Communicating between the Two Groups

The two stores divisions in some organizations are located next door to each other for easy communication. The clerical control group will require a very small amount of space as compared with the storage group, and in a compact organization it is a convenience for it to occupy a corner of the main storesroom. Where, however, the plant is extensive, it is more important for the clerical division to be closer to the planning, cost, and other factory office departments than to the storage division, as reference to the records is frequently made by the other departments with need for a speedy answer.

Wherever the two stores divisions may be located, some method of speedy communication between the two is required for a quick passing of papers when emergency matters require attention. Any method of communication may be employed which is convenient and certain. Some organizations use overhead basket carriers, others a scheduled messenger service, or again a pneumatic tube system may be installed. Mechanical methods afford a much more frequent and satisfactory service than can be maintained by messenger. In a large organization using the tube method, a tube is sent as soon as papers collect to fill one and messages pass continually to and fro.

Organizing the Materials Control Department

The internal organization of the materials control department should be laid out along functional lines, the principles of

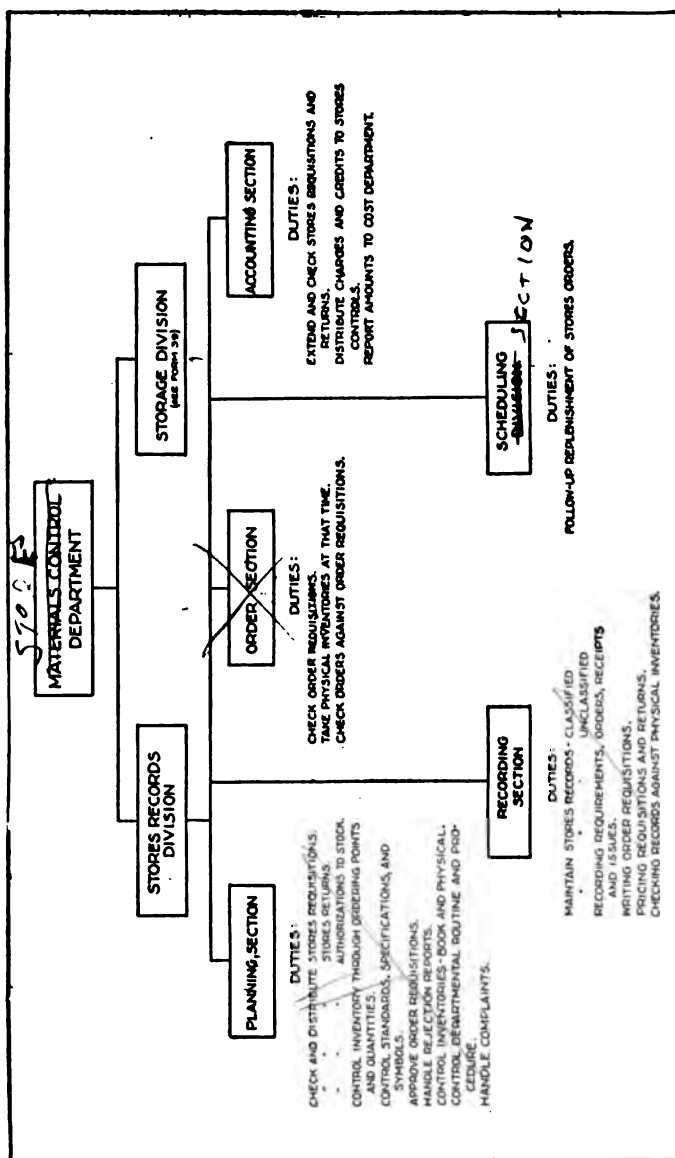
the division of work corresponding to the duties to be performed and the possibility of placing each duty in charge of a responsible head. Such separation of duties along functional lines creates what are called "sections."

While in this discussion the control work is assumed to be sectionalized internally by operations into a larger number of sections than would be necessary in a small concern, the basis and the need for such an organization in some plants should be visualized and understood even though the volume of work in most plants is insufficient to justify establishing all of the various sections. The relationships or duties shown on the chart in Form 38 exist in every stores organization even if it requires but one person to conduct the entire work. As the departments increase in size and importance, they can be divided into the sections required for proper control purposes.

Functional Organization

It is not out of place briefly to consider the chief advantages of organization along functional lines. First, it leads to the development of specialists and the centralization of each kind of work under one responsible head. Secondly, the individual is assigned to the particular job to which he is best fitted. If he has the ability and inclination to advance, he has ample opportunity to learn the work of all the sections. The head of each section, like the head of the entire department, is selected with a view to his ability to control the conduct of the entire work of his section. He plans all the special or unusual work to be done and sees that it is properly carried out. The routine work, once established and put in operation, takes care of itself so long as conditions remain the same.

While the sectional organization permits the head of each section to exercise a certain amount of authority over its routine, with the necessary assumption of responsibility for its success, any question or matter involving departmental policy



Form 38. Organization Chart of Materials Control Department—Stores Record Division

is referred to the department head. Thus the heads of the sections are the right-hand men of the department head.

Function of the Planning Section of the Stores Records Division

The most important section of the control department is the planning section. This section first receives all stores requisitions, stores returns, and authorizations to stock from whatever source they arise. Upon receipt these are checked for completeness and for the correctness of the items called for. For instance, a stores requisition should be correct as to the account symbol to which the material is to be charged, the quantity and unit desired, the material's symbol and definition, the delivery time and the delivery point, and the signature of the party approving the requisition. While checking these items the clerk can at the same time sort them by the class of material required. In this way each stock of requisitions is ready for the clerk working on the stores records for that class of material. If any item is incorrect and cannot safely be corrected by the checker without changing the spirit of the order, he must return it to the originator for correction.

The planning section also carefully checks the authorizations to stock (Form 9, page 55) or stores requisitions for unclassified material before releasing them in order to determine whether standard material cannot be substituted for the non-standard material ordered or to determine if any material in the by-product stores would answer the purpose. Here the head of the planning section will doubtless have to consult the department head who has ordered the material.

If the request to stock is approved, the planning section sets the ordering point and ordering quantity, classifies and symbolizes the material in the general scheme of standardization, establishes a unit of issue, secures a specification, and determines whether the material is to be purchased or manu-

factured. The planning section also determines the particular storesroom to which the material is to be delivered upon receipt, if it is necessary to store it elsewhere than in the general storesroom. All this information is entered on the authorizations, after which they are distributed to the recording section for preparing a stores record sheet and ordering the necessary quantity.

Changes in standards, symbols, and specifications should be made only on the approval of the planning section. The control of inventory should be centered in this section through the periodic reviews of the ordering points and quantities. Estimates or specific orders showing requirements of materials during coming periods are received by the head of the planning section and translated into terms of quantities of finished products, component parts, and raw materials and supplies ready for posting to the requirement columns of the stores records.

When purchase or production order requisitions have been written from the data on the records and then checked, they should be forwarded to the planning section for its final approval of the requisition of a new stock of that material and of the schedule for delivery. When signed the requisitions are forwarded to the proper department—purchasing or production.

Rejection reports, covering questions regarding acceptance of materials received on orders and referred to the materials control department by the inspection department should also be handled by the planning section, which investigates whether or not the questionable material is acceptable for the purpose for which it was procured. This section arranges for taking all inventories, both book and physical. In order to control the department's work, it is also responsible for any changes in departmental routine and procedure in handling the various papers. In short, when this section completes its work, the

work of the department is closely outlined and would be reduced to routine if new matters did not constantly recur for decision. To this section falls the task of removing obstacles in the way of the smooth running of the whole department.

Personnel of the Planning Section

This planning work requires two types of employees. The routine half is covered by such rules and regulations as to reduce it to a simple clerical job requiring little originality or initiative. The head of the section, however, should be a person who is always "on his toes," resourceful, and possessed of initiative and reliability. To him must be made known much information about the policies of the management and future plans of a more or less confidential nature. He must be able to recognize the point of view of his employers as well as that of the men under him in various questions referred to him for decision. Knowledge of the technical features of materials is desirable because standardization and specifications are handled by his section. He should be in sympathy with this philosophy of storeskeeping, since on him depends its success or failure.

The Function of the Recording Section

The recording section of the materials control department is entrusted with the work of maintaining the stores records, both for classified and unclassified materials. This includes the responsibility for keeping the supply above the "ordering point" and of watching for the "danger point." This section also posts all entries to the stores ledger records from requisitions, stores returns, material received reports, and copies of orders. From these papers the work of recording requirements, reservations, deliveries, and receipts is performed, those handling the work being on the lookout always to see that when the "ordering point" is reached an order requisition for the replenishment of stock is written.

When an authorization to stock is received from the planning section, a record sheet is written at once, using data on the authorization for filling in the heading on the sheet. The proper order requisition is then written and the sheet filed by the material symbol among the other record sheets.

Stores requisitions and returns are priced from the stores records at the time of delivery or receipt. If the value of the transaction is to be recorded, the requisition or return is extended at once and the figures are entered thereon. The recording section clerk also checks the ledger sheets each time a physical inventory of any material is made or a bin tag is received.

The work on order requisitions consists merely in checking the clerical entries and in requesting the storage division to take a physical inventory of the stock to make certain the material is needed before forwarding the requisitions to the planning section for final approval. A copy of the order which results from the order requisition is received and checked with the duplicate requisition to prevent the possibility of any error occurring in writing the order.

The head of the recording section should be an individual who is of a careful type of mind and who is painstaking enough to spend the time needed to run down any apparent error in his records. He should take pleasure in neatness and in keeping his records up to date and in the best condition. His work requires little initiative, but much painstaking attention to details.

Function of the Scheduling Section

The scheduling section of the materials department is to follow up the delivery of orders whenever requested by a member of the recording section or other authority, and to see that the schedules planned for are maintained. This position requires a clerk with some initiative to visit the manufacturing,

purchasing, and other departments which have anything to do with the procurement of the ordered materials. Only in organizations of exceptional size is the work of scheduling and following up orders of sufficient magnitude to keep employed more than one or two clerks.

Function of Accounting Section

The accounting section reckons the values of and tabulates the stores requisitions and returns handled by the recording section. Its purpose in so doing is (as explained in Chapter X) to distribute the charges and credits to the stores accounts and to summarize the stores requisitions and returns and the material received reports for posting to the control accounts. The control totals are reported to the cost department with the original papers and the summary distribution sheet. At the end of each month the journal voucher is written and forwarded to the cost department, covering the charges and credits to stores during the period. When physical inventories are taken and the inventory sheets have been priced, the accounting section extends the individual entries and totals them as a check against the accuracy of the balance of the control accounts.

This kind of detailed clerical work affords little variety from day to day, and has few interesting features to relieve its monotony. The head of the section should know something of the theory of accounting and of the specialized field of cost accounting.

Organizing the Small Materials Control Department

In all save very large organizations, the scheduling section would be combined with the planning section, and the accounting with the recording. These combinations retain the necessary checks, but still concentrate similar work without loss in efficiency so long as the volume of details is not large enough to require high specialization.

Organizing the Storage Division

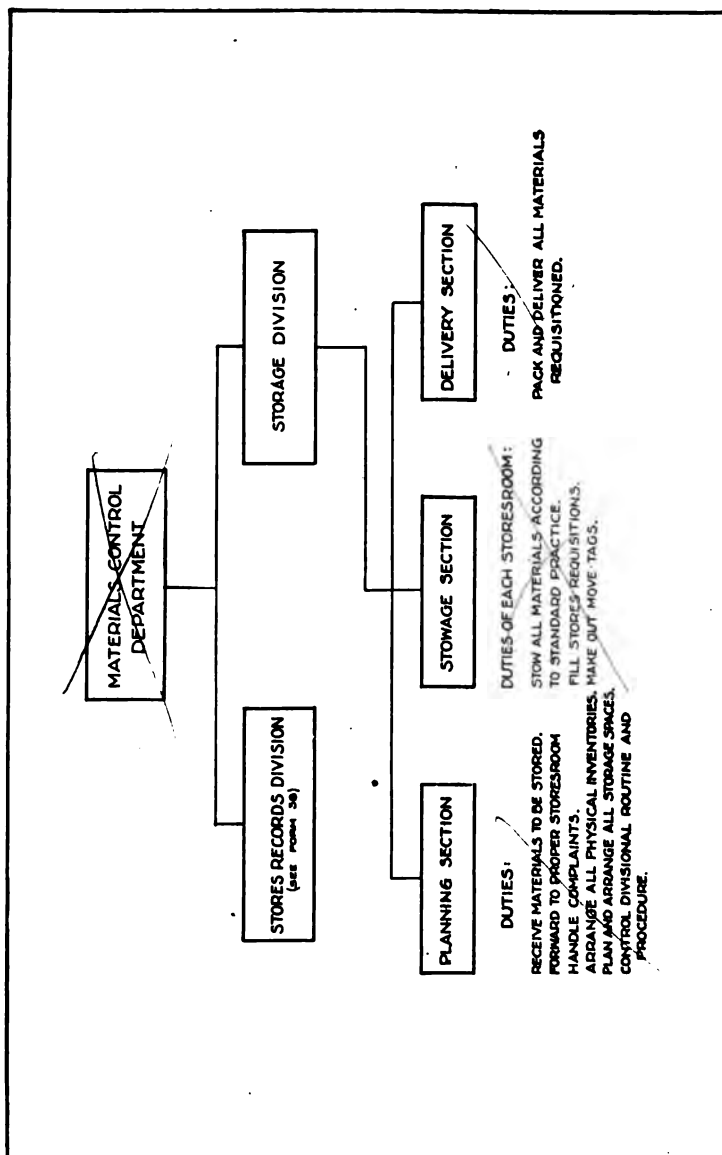
The storage division of an extensive plant may be divided into three sections, corresponding with the three spaces set aside for particular work, as discussed in Chapter XIII, "Arranging and Equipping the Storesroom," and as shown in Form 39. As in the clerical division, the chief section of the storage division is also a planning section whose task is to arrange the work of the other sections. It receives all incoming stores from the receiving and manufacturing departments after they have been passed by the inspectors. It directs the materials to the proper storesroom, or to the recipient in the case of unclassified materials for immediate delivery. The material is receipted for by the planning section signing the materials received reports, which are then forwarded to the stores records.

After reservation, all requisitions are received by the planning section from the recording section, and the move tag (Form 32, page 181) for that requisition is written at once. If the material is wanted immediately the requisition is sent to the proper storesroom. Requisitions for material not on hand and not calling for immediate delivery are filed in a tickler file until time for the delivery to be made.

The determination of standard methods for storing materials and the general layout of the storesrooms are also handled by the planning section. All special problems of storage are decided by the head of the planning section and for this reason he should be a specialist in the methods and applications of the principles of storage. Moreover, it is his duty to investigate complaints about the service rendered by the stores departments, such as the non-delivery of material when wanted.

The Stowage Section of the Storage Division

The stowage section is the custodian of stores. Clerks in this section receive the materials which the planning section has signed for, stow them according to standard methods in the



Form 39. Organization Chart of Materials Control Department—Storage Division

proper storage spaces, and safeguard them until requisitioned. Then they make the entries on the bin tag, remove the material from the storage space, attach the move tag to it, and forward it to the delivery section and the requisition to the stores records. If there are a number of storesrooms, each should be under the control of the head of the stowage section so far as the physical work and arrangement are concerned. No work requires more careful attention to detail, and the employees of the section must be willing and capable of exerting the care required.

The Delivery Section

The delivery section packs, routes, and delivers the stores which the stowage section collects on requisitions. As before noted, these may require packing and it is often possible to consolidate several items for the same department into one package. When the packages are done up and routed, they are loaded on the trucks for the deliveryman to take to their destination. The main part of the move tag is signed by the recipient and is brought back by the deliveryman as the receipt for the safe delivery of the material. These receipts are turned over to the planning section for temporary filing, until such time as no question is expected to arise concerning the delivery of the material.

In the small concern the functions of planning and delivery are usually combined. It will be seen that most of the storage work is physical and calls for little clerical ability.

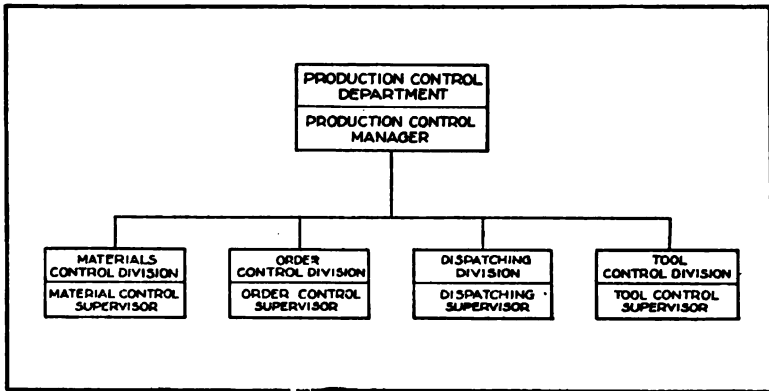
PART III
PROCUREMENT BY MANUFACTURE

CHAPTER XVII

ORGANIZATION OF PRODUCTION CONTROL DEPARTMENT

Function of the Department

Up to this point the discussion has covered the work of materials control so far as concerns the determining of the values of the inventories carried in stores and the movement of materials, parts, and finished goods into and out of the storesrooms. The relationship between the system of materials control and the work of the manufacturing departments has been indicated only in broad outline, without detailed consideration of the method of fitting the materials control system into the whole scheme of production control. To describe in detail the standard methods of production control and consider their adaptation to varying conditions of plant and manufacture would involve the discussion of principles and methods of management that are not properly comprised within the title of this book. Both in a small plant making a few simple products or producing one type of article, as a foundry, a glass works, a twine mill, etc., and in a large organization manufacturing a multiplicity of products, the management should bring all clerical functions and activities assisting the manufacturing departments under one supervising head. A "production control department" should be formed of the materials control, order or planning, and other related departments, for the purpose of gathering the reins of manufacturing management in one supervising hand. The materials control department then becomes, so to speak, one of the right-hand men of the production control department, as illustrated in the chart shown in Form 40.



Form 40. Organization Chart of Production Control Department

The work of the unified production department may be divided into three broad divisions, the functions of which are :

1. To standardize the articles to be produced, the operations to be performed, the materials and tools to be used, the jigs, fixtures, and gauges required for carrying out the operations.
2. The laying out or planning of the work to be done and the formulation of the responsibilities of the departments to which its performance is allotted.
3. The balancing and grouping of men, materials, and machines so that the work called for by production, plant, or expense orders may be accomplished within a prearranged schedule.

Order Handling Procedure

Before describing the organization of the production control department, it is advisable to give further consideration to the orders by means of which work is controlled and the factory activities are set in motion.

It is an axiom of production control that no shop should begin any work except by the authority of an order of some kind, and that all time spent and materials used must be charged

to the proper order. The forms and records employed to collect these charges will be discussed in following chapters. For present purposes it is only necessary to describe the general methods of planning the factory activities. The nature of the three types of factory orders—production, plant, and expense—has been described in an earlier chapter.

Production orders are based on the estimated sales budget, and schedules are originated from the stores records and scheduled as far ahead as the nature of the business permits for the delivery of specified quantities of finished product to the finished stockroom—assuming that the production is for stock, as should be the case in every factory manufacturing a standard product. The planning of the production orders begins as soon as the schedules of production requirements have been drawn up. Determining the possibility of meeting the schedule is the first step. If the parts or finished products called for are standard articles previously manufactured, all the data will be on file relating to materials, tools, jigs, and dies, if any, required for the work, as well as standard practice records describing the nature of the operations required by the order and the time necessary to complete them. If the products called for are of a new type, the above data must be carefully drawn up and made a permanent record, using as a basis such past experience on work of a similar kind as will permit the requirements of the order to be specified and planned for. The method of planning the preliminary work before a production order is set in motion is reserved for later discussion.

Plant increase or plant betterment orders, though few in number, require detailed planning in the same way as production orders. They differ from production orders only in two ways. As previously explained, they are charged to a suitable asset account instead of to finished product, and they are initiated by a request received from a department for their performance, or the policy of the management calling for

certain betterments to be carried out or certain additions to the plant, fixtures, patterns, etc., to be made. As a rule plant orders are fitted into the production scheme as circumstances permit, and they are often issued as a means of taking up the slack during dull periods of business.

Expense orders, as previously stated, are issued for plant repairs or for activities chargeable to some expense account. Such work is set in motion by the production control department when the necessity arises, whether or not a request may have been received for its performance. Such orders call for little or no planning and are the simplest kind to handle. Usually the work to be done is of a minor character and often a sufficient description of the job cannot be secured to permit a detailed plan. The control consists in scheduling a worker to do the job by a certain time.

The Production Control Department

This central department is to become the planning and scheduling function for the manufacturing departments. It is a production control department in that it is responsible for telling "what to work on" as well as "the rate at which production operations are to be carried out." More specifically, this function is to co-ordinate the workings of all operating departments so that operations of manufacture may be accomplished most economically and on schedule. To do this it must have control of the stores records, as was stated in the previous discussions, and accordingly will take over all the work outlined as the function of the department handling the stores records.

The production control personnel will consist of :

1. The production control manager
2. Materials control supervisor
3. Order control supervisor
4. Dispatching supervisor
5. Tool control supervisor.

together with as many clerks subordinate to the respective supervisors as will be necessary for carrying out the work. This organization is charted on Form 40.

The Production Control Manager

The production control manager is an expert production engineer with the technical ability to supervise the methods of manufacture and the executive ability to direct the performance of the personnel of the production department. As an engineer he should be versed in the principles and practice of shop control; as an executive it is his function to co-ordinate the production departments' efforts with the actual requirements of the business as determined by such schedules of sales and production preferences as are outlined to him by the management. In his engineering capacity he should draw up data and statistics for filing and future use of the total capacity of all productive units; in his executive capacity he anticipates and reports available productive capacity, and plans for its efficient utilization. Thus his duties comprise not only the planning for the work to be done but the supervision of its performance and the efficiency of its execution.

Materials Control Supervisor

The work of this division has been thoroughly discussed in the preceding chapters. With the formation of the production control department, all materials control is incorporated herein and becomes the basis of the work of other divisions of the department. Nothing further need be discussed regarding its work.

Order Control Supervisor

The order control supervisor is the scheduler of the production department. He draws up the time-table by which materials are delivered to machines, and a steady stream of

work is kept in process up to the capacity of men and machines. Following the receipt of the requests for production (most of which come from the materials control supervisor), he makes up the production orders and schedules them in their proper sequence upon the "control board" (to be explained in next chapter) prior to the dispatching of the work to the production departments. He is responsible for seeing that the time a given order will be in process is indicated by making out time cards which when placed upon the control board serve as signals and time-table to the progress and record clerk and to the foremen. By means of his control board and its subsidiary progress record, he is at all times able to furnish information to any party regarding the progress of an order and the schedule it is expected to maintain. By his scheduling in proper sequence and on the proper dates, he controls the activities of the manufacturing departments.

The record of the progress of shop operations performed on parts and assemblies on various orders is connected with the maintenance of time standards as materials flow through the factory. By means of these comparative records of scheduled standard time and "actual times" of performance, the order control supervisor maintains a continuous check on shop performance and collects the data required for the revision of standard production rates and for the more accurate planning of future orders.

The Dispatching Supervisor

The function of dispatchers is the dispatching of the current jobs to the departments responsible for their completion and the clerical work of the records which can be most conveniently handled in operating departments. They should have a complete knowledge of all "jobs being worked on" and their "starting times" and "quitting times," as well as "next jobs ahead" by preference, and whether the proper instructions,

materials, tools, and so on, necessary for the successful doing of work, are or will be available at the start of "next jobs." Also, in co-operation with the foremen, they assist in the development and connection of standardized methods and practice, so that all question as to "where," "how," and "in what time" jobs are to be done are more fully known and are reduced to permanent record in writing so classified and filed as to be readily available when wanted. The work of the dispatchers is explained in more detail in Chapter XIX.

Tool Control Supervisor

The tool control supervisor occupies a position regarding small tools similar to the materials control supervisor's position regarding materials. He is responsible for the storing of all small tools, jigs, fixtures, dies, templates, patterns, and drawings, which responsibility includes the supervision of the tool cribs and other storage places. He must plan and schedule the use of these tools so that they will always be in working condition and ready for use. This involves the forwarding of all tools needing repairs to the proper department, requesting the order control supervisor to schedule that work. If tools cannot be available when wanted for production, the order clerk should be informed of the fact in order properly to schedule his jobs. When new tools are needed, the tool supervisor orders them. Another of his functions is to work with the equipment engineer and the manufacturing executives in the development of new and better tools and machine practice.

CHAPTER XVIII

GRAPHIC PRODUCTION CONTROL ¹

Necessity for Graphic Method

The aim of factory management, baldly stated, is to produce the largest quantity of product with the minimum expenditure of time and effort and with the minimum investment of plant, machines, and inventories. In consequence, the most important of managerial functions is to regulate the flow of work in process through the shops in accordance with this aim. The effort of men applied to materials through tools and machines must be so co-ordinated that smooth operation is insured in every detail between the receipt of the raw material and its dispatch as finished goods. To insure this smoothness of operation it is not sufficient to have a system of records; the system must function properly and the management must be acquainted, from hour to hour, if necessary, with the manner in which the factory machine as a whole is functioning. This information should be visualized in some way. When we ask the time of day and somebody replies 12:35, we mentally visualize the hands of the clock in a certain position; but a glance at a clock is a much quicker method of getting the knowledge. Similarly a planning board which visualizes the progress of factory activities as a clock visualizes the progress of time is a much quicker method of reporting the progress of work to the management. For this reason, in modern factory

¹ The procedure described in this and the following chapter has been developed by the C. E. Knoeppel organization and is explained in detail in Mr. Knoeppel's work, "Graphic Production Control." The principles stated are applicable to all plants, but the details described are those of an "equipment type" of production control system, such as could be used in the more usual machine and assembly plant manufacturing a standard product. Necessarily the procedure must be modified in its details to fit the special conditions in each plant.



Form 41. Control Board

operation the graphic method has become the standard method of control.

Function or Purpose

The function or purpose of a definite procedure for handling production orders, from their receipt to their final completion in the shop, is primarily to produce more parts per unit of time—thereby reducing costs—and to meet sales requirements.

The key to this is the establishment of standard hourly production rates representing the quantity of production that should be produced on each operation in a given time. Inasmuch as wage, burden, and production rates are directly related to time, this is a means whereby not only *rates* of production but also the *costs* of production may be controlled.

By use of control boards, dispatch boards, and the related auxiliary elements of definite shop control, work may be scheduled to the places best able to execute it, as well as being scheduled relative to the dependence of successive operations on each other. By suitable regular and “up-to-the-minute” reports of machine irregularities and idleness, absent operators, and other contingencies affecting operations, conditions which hold up production, can be quickly remedied and even anticipated. Available productive capacities may be anticipated and reported as they arise. Thus, this visualization of current operating conditions gives a basis for keeping the investment in productive capacities continually producing maximum profits.

The following tabulation presents the various advantages:

1. A complete production schedule fitted to sales schedules as to quantities and as to dates for completion.
2. A complete control of the inventories of raw materials, finished parts, materials in process, and finished product.
3. A scheduling of all shop production units as far ahead as the work ahead will last.

4. A balancing of amount of work ahead of various production units so as to maintain proper co-ordination and relationship.
5. A complete knowledge of all jobs ahead of various units.
6. A knowledge that all necessary material is on hand before an operation is started.
7. A knowledge that all necessary tools are on hand before an operation is started.
8. The recording of the progress of an order through the shops in order that all parts may be ready for assemblies, both minor and major, and may be finished at times wanted.
9. Recording of the standard time for each operation and the actual time of performance, so that a continuous revision of standard hourly production rates is brought about.
10. A recording of the factors of production through charts, tables, and graphs so that analysis of variations in factors of production may be observed and faults may be remedied.
11. A continuous reporting to the management of the progress of orders.
12. A collection of data to enable the proper costing of products and basis of estimate.
13. Statistics and tables of comparison, showing production results for the month and year to date, for use of management.
14. An analysis of the causes of results and failures, and the corrective measures to be applied if necessary.

Means or Machinery of Performance

The production order handling procedure is closely related to several means or mechanisms. They are as follows :

1. Control boards (Form 41), which really are maps of all productive units of a shop. They are visible files of time cards prior to going into operation in a shop. They allow these cards to be scheduled ahead of the production units upon which the work is to be performed, in accordance with the duration of the operations and the sequence of performance. They are the means of showing how close the shop is operating to the scheduled standards.



Form 42. Dispatch Board

2. Dispatch boards (Form 42), for display of the "jobs working on" and "next jobs to do" for every production unit in a shop.
3. Standard machine practice card (Form 43), to be filed on the control board opposite the appropriate machine. It shows the type, capacity, rating, and power of the machine and its specialties.
4. Standard parts list records (Form 44), giving complete bills of material for each finished product; that is, information as to quantity of each part required, class of material, assembly sequence, piece and assembly symbols, symbols of blue-print records and production analysis records, and so on, for each part or material required.

DESCRIPTIVE NAME				LOCATION & SYMBOL	
RANGE		TOOL CHARTS		SETTING CHARTS	
POWER	BELT	PWR. PULLEY	R.P.M.	C-S PULLEY	R.P.M.
OPERATIONS DONE					

SPECIALTIES
STANDARD PRACTICE THIS IS THE CORRECT STANDARD PRACTICE FOR ABOVE PRODUCTION UNIT, ARRANGED THIS WAY FOR QUICK REFERENCE

Form 43. Standard Machine Practice Card (face and reverse). (Size $7\frac{3}{8} \times 3\frac{1}{4}$.)

5. Standard production analysis records—one for each part or assembly.
 - (a) Form 45, showing sequenced operations with auxiliary small tool requirements, best and alternate production unit, and standard ratings of set-up, production per hour, and so on, for each operation.
 - (b) Form 46, showing the quantity in a standard manufacturing lot or batch, raw material requirements, and best flow through successive operations.
6. Blue-prints of all parts laid out in sufficient detail to give full working knowledge of the necessary operations to be performed.
7. Stores records (such as Forms 7 and 8, pages 47 and 51), showing all pertinent data concerning the material covered, the current requirements, the quantities on order, the quantities received into stock, and the quantities issued from stock as described in Part II.
8. Progress and follow-up records (Form 47) are the keys to control boards and present a means of following pieces through the shop, recording machines upon which operations are performed, scheduled rates of operation and number of good and defective pieces produced. By signaling the dates at the top, special conditions needing attention are constantly kept in mind.
9. Identification, instruction, and routing cards (Form 48), for identifying all material in process and later to be used as notification of delivery to stores.
10. Material requisitions (Form 12, page 72, and Form 49), for ordering exact quantities of material to be delivered to production units for certain orders.
11. Material credit cards (Form 16, page 79, and Form 50), for returning any excess material to the storesroom.
12. Time cards (Form 51) are the orders to individual production units, giving operation numbers and descriptions, standard production rates, routing of operations, and special instructions. After completion of work, these reports carry such additional information as number of pieces finished and actual time of performance. Time cards form the basis for costing direct labor, and give a means of measuring each operator's and shop's efficiency.

ORDER		PRT. OR GROUP		PROGRESS AND FOLLOW-UP RECORD												QUANTITY		ORDER DATE												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DESCRIPTIVE NAME OF WORK																		H-408												
RAW MATERIALS				ON HAND? FROM RECEIPT				ON HAND? FROM RECEIPT				AUXILIARY TOOLS						BLUE PRINTS												
ON HAND? WHERE?				ON HAND? WHERE?																										
START				PRODUCTION QUANTITIES - MAJOR OPERATIONS				FINISH																						
OPTIN #		PLACE		RATE		OPTIN #		PLACE		RATE								OPTIN #		PLACE		RATE								
D & P		GOOD		BFTV.		D & P		GOOD		BFTV.		D & P		GOOD		BFTV.														

ORDER NO.	PART OR GROUP	BLUE-PRINT	STARTING PLACE	THIS DATE
QUAN. ON ORDER	QUAN. THIS LOT	NUMBER LOTS	LOT NUMBER	STARTED MFR.
CONTRACT		TO BE COMPLETED?	FINISHED MFR.	
INSTRUCTIONS				
SHOP IDENTIFICATION AND INSTRUCTION RECORD				
KEEP THIS CARD WITH WORK UNTIL COMPLETED AND RECEIVED BY PROPER DEPARTMENT. THEN RETURN TO CONTROL DEPARTMENT.				

FACE

ROUTING INSTRUCTIONS	OPERATION	PLACE MACH. SECTION	QUAN. POINTS	INSPECTION													
	1																
	2																
	3																
	4																
	5																
	6																
	7																
	8																
	9																
	10																
	11																
	12																

REVERSE

Form 48. Identification, Instruction, and Routing Card (green; face and reverse). (Size 6 x 4.)

13. Inspection reports (Form 52), reporting all defective production of parts.
14. Idle equipment (Form 53), reporting periods of idleness, with statement of cause, probable duration, and action to be taken to remedy.
15. Control progress strips (Form 54), for registering on the control board accomplishment in the shop on production orders.

ORDER NO.		FOR PART OR GROUP		TIME WANTED	DEPT.	DELIVER TO WORKING PLACE	QUAN. ON ORDER	DATE
MATERIAL REQUISITION (STOCK)						ORDER NUMBER	CREDIT ACCT.	DEBIT ACCT.
FILL FROM	QUANTITY ORDERED	QUANTITY FILLED	SYMBOL	DESCRIPTION		WEIGHT	PRICE	UNIT
DATE FILLED								AMOUNT
FILLED BY								
RECEIVED BY								
ITEMS BELOW ARE TO BE FILLED IN ONLY BY OFFICE.								SIGNED BY
CREDIT ACCT.	DEBIT ACCT.	RECAPED BY	TOTAL AMOUNT	ENTERED BY	PRICED BY	EXTENDED BY		

Form 49. Material Requisition Card (pink). (Size $7\frac{3}{8} \times 3\frac{1}{4}$.)

ORDER NUMBER		FOR PART OR GROUP		DEPT.	FROM WORKING PLACE	QUANTITY ORDERED	DATE
MATERIAL CREDIT						ORDER NUMBER	CREDIT ACCT.
SENT TO	QUANTITY RETURNED	SYMBOL	DESCRIPTION		WEIGHT	PRICE	UNIT
DATE REC'D							AMOUNT
REC'D BY							
ITEMS BELOW ARE TO BE FILLED IN ONLY BY OFFICE.							
CREDIT ACCT.	DEBIT ACCT.	RECAPED BY	TOTAL AMOUNT	ENTERED BY	PRICED BY	EXTENDED BY	SIGNED BY

Form 50. Material Credit Card (white card, red ink). (Size $7\frac{3}{8} \times 3\frac{1}{4}$.)

- | ORDER NO. | | PART OR GROUP | | FROM | | TO | | QUANT ON ORDER | | DATE | | WORKER'S NO. | |
|--------------------|--------------|---------------------|------------|------------------|------|------------------|--------------|----------------|---------|---------|-------------------|--------------|--|
| WORKER | ORDER NUMBER | DEPT. | TIME PLACE | OPERATION | QTY. | GOOD | LABOR | LABOR | BURDEN | COST | | | |
| STD. HRLY. PROD. | | | | TOTAL PROD. | QTY. | LAB. HRS. | LAST BALANCE | | TIME | | ANALYST'S FACTORS | | |
| DEPARTMENT | | | | DESCRIPTIVE | | BAL. TO DO | | STOPPING TIMES | | | | | |
| WORKING PLACE | | | | | | S.H.R. CREDIT | | STARTING TIMES | | | | | |
| NUMBER OPERATIONS | | | | | | S.H.R. NEXT QTR. | | ELAPSED TIMES | | | | | |
| | | | | TOTALS | | | | | | | | | |
| | | EMPTS. | TOTAL GOOD | NEXT S.H. CHARGE | | CARD NUMBER | | CIRCLE LAST | | MACHINE | | HOURS | |
| TIME CARD (DIRECT) | | | | | | | | | | | | | |
| THIS OPER. NO. | | THIS OPERATION NAME | | LIMIT | | LABOR AMT. | S. RATE | BURDEN AMT. | CARD BY | CHARGE | ENTERED | PROG. | |
| | | | | | | | | | | | | FOR SIGN. | |

Blue-print copies of all the above standard production analysis records should be furnished to every foreman and shop executive who is interested in them. Each tool crib should have a complete set.

ORDER	WORKING PLACE	WORKERS	THIS DATE	TO	FORWARD THESE PARTS	QUANTITY TO FORWARD
THIS MATERIAL IS SCRAP AND CANNOT BE UTILIZED FOR ITS ORIGINAL PURPOSE. A CARD IS ATTACHED SO AS TO PREVENT THIS MATERIAL BECOMING MIXED WITH GOOD WORK.						
INSPECTOR	TYPE	PART OR GROUP	STD. PROD. RATE a	FAULT b	DISPOSAL DIRECTIONS	
SEND TO CONTROL DEPARTMENT	STAGE OF OPERATION		MRS. DEDUCTION a	QUANTITY b	REASON'S SCRAPPED	
INSPECTOR'S SUGGESTIONS FOR REMEDY						
PROCESS & FINAL INSPECTION REPORT						

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DEPT. NO.		MACHINE NO.		IDLE EQUIPMENT REPORT				DATE			
NO OPERATOR 1	NO POWER 5	MISCELLANEOUS 8	REGULAR 1	DEPT. MACH. NO.		HOURS		5		00	
			SING. PLR. 2	CARD BY		TIME ANALYSIS					
NO MATERIAL 2	AWAITING SET-UP 6	HOURS IDLE	STAND BY EQUIP. 3	ENTERED		STOP					
NO ORDERS 3	AWAITING TOOLS 7	REMARKS				START					
						ELAPSED					
MACHINE BREAK DOWN OR LAGGED REPAIR 4	AWAITING INSTRUCTIONS 9										

Form 53. Idle Equipment Report (red card). (Size $7\frac{1}{8} \times 3\frac{1}{4}$.)

Description of Control Boards

Prior to tracing the movements of a production order, it would be well to give a description of control boards and dispatch boards and how they function.

Control boards are 7 ft. $9\frac{1}{2}$ in. long, 8 ft. $2\frac{3}{4}$ in. high, with a base 10 in. high, 33 in. wide, supporting the upright part. Extending across the center are 50 time-scale strip pockets, made of sheet steel, $1\frac{3}{4}$ in. deep and 60 in. long. These strip pockets overlap, being spaced $1\frac{1}{2}$ in. apart, making a total height of pockets 6 ft. 3 in. Above and below these strip pockets are steel clips $1\frac{1}{2}$ in. wide and extending the width of the distribution pockets. These are holders for the date and day cards.

On each side of and parallel to the strip pockets are 50 steel clips $1\frac{1}{2}$ in. wide and $5\frac{1}{2}$ in. long, for holding description and number cards of the production units to be controlled: i.e., two cards to each unit.

On the left-hand edge of the board are 100 filing pockets, i.e., two pockets opposite each strip pocket. The upper is for holding the standard practice card of the machine (Form 43). The lower is for holding time cards (Form 51) after the opera-

tion is performed and prior to extension and computation. On the right-hand side of the board are 50 distribution pockets, i.e., one to each strip pocket for holding time cards not yet scheduled.

There are metal frames sliding on the upper and lower date scales, holding two colored plumb lines for framing the current date. These lines are an appropriate number of hours apart, i.e., one working day, the significance being that cards within the cords are regular and safe. Those cards behind the cords are behind schedule and dangerous, and call this fact to the attention of the control supervisor so that remedial measures may be taken.

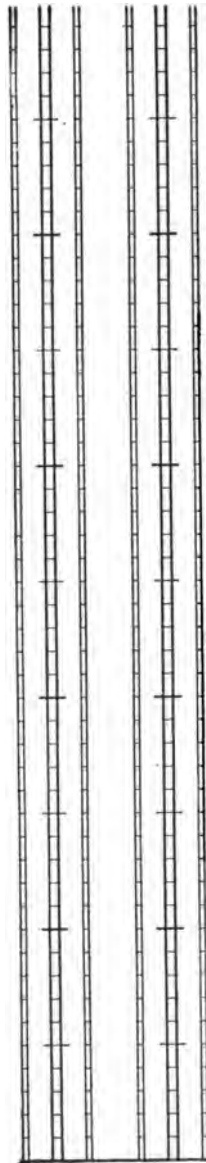
Both sides of the board are utilized, one being the duplicate of the other. Thus 100 machines may be controlled by means of one board.

This, in brief, is the mechanical construction of the control board.

Control Board Operation

Control boards are really maps of the production units of the shop. Each production unit stands by itself, and relations between operations on all production units are established on a time basis because the graphical scale of time is the same for all production units.

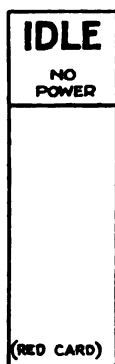
The information available on the control board is as follows:



Form 54. Control Progress Strip. (Size $10\frac{1}{2} \times 3\frac{1}{4}$.)

1. Hours of work scheduled ahead for each production unit.
2. Hours of work ahead for which material is available.
3. Times at which deliveries of material must be made from preceding operations or production units.
4. Times at which deliveries of material must be made to next operation or production unit.
5. Production unit or place at which previous operations are done, or source of routing.
6. Production unit or place at which next operation is to be done, or next place of routing.
7. The shop order number, unit, quantities upon order, schedule, descriptive name, and number of parts, operation or operations done at one setting, and the standard production per unit of time on any order.
8. The ability of the shop to keep up with production rates and schedules.
9. Causes of hold-ups and idleness and remedies for the trouble.

Handling and scheduling a large number of unclassified tickets with facility presupposes that means of definite distribution are available. This is admirably taken care of on the control board by means of the distribution pockets.



Form 55. Signal Tags for Control Board. (Size $\frac{3}{4} \times 2\frac{1}{2}$.)

Graphical scales for scheduling work against production units are arranged to post 300 hours of work against each machine, bench, floor, or other working place. The date scale is arranged above the strip pockets so that each day takes up a space equal to the number of shop working hours for a day. As time

progresses, the vertical plumb lines separated by space equal to one day are moved across the face of the board. Comparison of the graphical progress of the work at each production unit with the position of these cords indicates whether the work is ahead or behind schedule.

The means of conveying instruction to go ahead on the work scheduled on control boards to the place where operations are actually carried on is furnished by workers' time cards (Form 51).

As work is performed, accomplishments and elapsed time consumed in work are registered on this ticket. It then returns to the control board, and is used as a basis of registering progress, recording the success of the shop in meeting standard production rates.

Description of Dispatch Boards

Dispatch boards are of two general types: (1) unit dispatch boards covering but one production unit, and (2) group dispatch boards, as illustrated in Form 42 (page 226), covering a number of production units, which are closely related.

Usually production units are formed of a worker and a machine. Sometimes, as in maintenance work, when a machine is not used, the production unit becomes the worker only. At other times, a production unit is composed of a crew or gang of workers and one machine as in a rolling mill. In a machine shop, where the number of machines is greater than workers, a production unit is a machine to which a worker will be assigned.

Usually unit dispatch boards are placed upon or close to the production unit served. They are used where there are only a few machines in a department, or where the machines are scattered in location. Group dispatch boards are constructed like a number of unit boards mounted upon a single base, and are used where the machines are located close together for convenient service by the dispatcher, foreman, and inspector, as well as the workers. The dispatch board illustrated is fitted for 40 production units, 20 on each side.

For each production unit there is an identification marker and two clips arranged vertically. The identification marker gives the symbol of the production unit and a short description.

The two clips are for holding the time cards brought by the dispatcher to the dispatch board from the control board.

Dispatch Board Operation

In the upper clips are filed the time cards for the jobs to be done, arranged in the order of their schedule: i.e., the first "job to do" is placed first, etc. The lower clip is for filing the time card of the "job doing," this card being transferred from the upper clip to the lower when the worker starts the job.

Upon the table of the group dispatch board are two trays, one of which has two pockets and the other several. The first pocket of one tray is for placing the time cards for completed jobs which have not yet been process-inspected. When the time cards are process-inspected, they are ready for posting to control board and are placed in the second pocket. The second tray is for holding surplus stocks of time cards and similar forms.

At all times the dispatch boards show :

1. The jobs ahead for each production unit during the next working day, ready to be worked upon and the sequence in which they are to be performed.
2. The production units working and the workers who are attending them.
3. The production units idle, as each unit without a "job working on" time card in its lower clip must have an idle machine report thereon.
4. The jobs being worked upon, the quantity to be completed on the operations, and when they should be completed.
5. The routing, showing the previous, present, and next operation of the jobs being worked upon.
6. The standard hourly production rate of the "operation doing" and the succeeding operation.

The above procedure is called "dispatching" and will be described in more detail in the next chapter.

CHAPTER XIX

OPERATION OF PRODUCTION CONTROL MECHANISM

Origin of the Production Order

The routine of handling orders is illustrated in detail by a graphical chart (Form 56). The manufacturing orders originating from the stores records comprise the bulk of the orders to be controlled. As the procedure for their origin is the start of the production order handling procedure, it is necessary to trace them.

Customers' orders of purchase are authority for consideration of the starting of manufacturing orders. But any plant manufacturing "for stock" and not "to sales order" must allow sufficient time for such manufacture; hence, customers' orders are considered en masse to determine sales requirements over a coming period. On the first of each month the selling department compiles a schedule for the production department, showing definite expected requirements of each kind of finished product during the coming month. The production department uses this schedule as a basis of its production schedule. Any very unusual requirement, such as a special bedplate for a lathe, would be taken from the purchase orders themselves as the occasions arise.

A tentative schedule is also made up six months in advance for general guidance in determining production policies and programs during that period.

Upon receipt, the quantities from the monthly schedule are posted to the requirements column of the finished product

stores record. The requirement, with a consideration for the quantity to be shipped before the first of the coming month and the quantity of the margin of safety, is compared with the quantity on order and the amount on hand to determine the amount available, as described in Chapter XI on "Control of Inventory."

If the requirement is greater than the amount available, a progress and follow-up record card (Form 47, page 230) is made up for the minimum economic quantity to be produced, or for a greater quantity if needed or more expedient to be ordered at this particular time.

Standard Practice Records

These record cards are matched with the several production analysis records (Forms 44-46, page 228) to obtain the data necessary to plan the order. These reference records are made up once to cover every part and product made, becoming then master records subject to correction and revision as conditions of manufacture change. Production analysis records must be kept accurate and up to date. This includes every copy in both office and shop.

When matching the record card with these master files, if no records are found for that product, the production control manager, working with the engineering department, must make up temporary but complete records as a means of planning this production. From judgment based upon accomplishment on the order, permanent records will be made up and issued in the regular way.

The temporary records will be based upon the following:

1. Work of similar nature which has been done before.
2. The control manager's knowledge of the practical production rates possible.
3. Conferences with the foremen, and in some cases conferences with the workmen, as to what can be done.

Standard Parts List Record

If the product is an assembly, the standard parts lists record (Form 44, page 228) is the first record used. It shows a tabulation in order of assembly of all parts and materials used in any product, together with the following pertinent information about *each* part:

1. Name of the part.
2. Legend of source and the assembly sequence.
3. Other applications of the part.
4. Quantity used in each product.
5. Material used in the part.

Standard Production Analysis Records

The progress and follow-up record card (Form 47, page 230) is then matched with the two standard production analysis records. Standard production analysis form (45, page 228) shows the complete manufacturing data for one part or one assembly. The following data is necessary for each order:

1. Name of part.
2. Small tool requirements per 1,000 pieces.
3. Operation name and number in proper sequence.
4. Routings of production units on which each operation can be done best.
5. Standard ratings of time required to set-up the operation, and the standard hourly production rate known as the "SHP" for the operation.

Standard production analysis form (46, page 228) shows:

1. Standard manufacturing lot or batch quantity, which is the quantity to be kept together as a routing unit. Each lot has an individual identification and routing card (Form 48, page 231).
2. Average number of days required to complete lots or batches from raw material.
3. A graphic chart of the "best flow" for successive operations, showing the minimum possible time to make 1,000 pieces. This possible time is that which accomplishment

is to be measured by instead of allowing parts in process to drift.

4. The raw material or parts requirements for making 1,000 pieces. The quantity required for an order will be some multiple of this quantity.

Thus full data on manufacturing details and requirements of subassemblies, parts, and raw materials are determined. These requirements are posted to the stores record, paired up with the available, and a progress and follow-up record card is written up if more are required. The process of determining the order quantities is continued until all materials and parts are ordered. Raw materials and any parts secured by purchase should be covered by a purchase order requisition instead of a progress card.

The individual progress and follow-up record (Form 47, page 230) is written up in detail to show the following information:

1. Order date and order number.
2. Material symbol and name.
3. The quantity on order.
4. The scheduled date to begin and to complete the order.
5. If special manufacture for a shipping order, the name of the customer and the shipping order number.
6. The operations in sequence, but never more than five as this number is sufficient to key all work.
7. The working place of each "key" operation, the name of the operation, and the standard hourly production rate.

Progress and follow-up records are filed by order number in one of three files: production orders not yet started, in process, or finished, depending on the condition of the order. Over the proper date at the top of the card a signal tab is placed for indicating when the order should be reviewed for any condition requiring attention and judgment in exercising control.

Each production control form has a specific service to per-

form in operating and maintaining a control of production and of costs. These forms are the means of control of all shop activities. It must not be expected, however, that the printed matter itself controls. When we speak of "control," we mean that the control mechanism properly carried out according to definitely written instructions will furnish a guide-post and time-table for initiative on the part of all shop and office executives, so that there will be no confusion and no overlapping of responsibilities and control.

Cost Sheet

When the progress and follow-up record is being written up, the cost sheet (Form 27, page 129) should be made out and forwarded to the cost department as notice or authorization to place the order in the work in process record file.

Identification, Instruction, and Routing Cards

Identification, instruction, and routing cards (Form 48, page 231) are next made out—one for each batch or lot quantity as shown by the production analysis record. The following information is placed on each card:

1. Order number and order and lot quantity.
2. Part number.
3. Starting working place.
4. Any special instructions regarding how operations are to be carried out or regarding the disposition of completed product.
5. Source of raw material and final destination of finished parts.
6. Routing and operations in proper sequence, with production unit numbers on which each operation is to be done.

Workers' Time Cards

Workers' time cards (Form 51, page 233) are made up, one card for each production unit, for each day, for each operation

—so that they will be sufficient for recording the schedule, as well as reporting the progress and time taken on all the operations necessary to carry out the work. Cards are made up in sufficient quantity so that there will be detailed daily reports on all work done on each order. Each card has a time scale for ten hours corresponding to the date and day scales.

Information used in making up time cards comes from progress and follow-up records and standard production analysis records. The information placed on each time card is as follows:

1. Order number and order and lot or batch quantity.
2. Part number.
3. The working places where the operations are to be done on that operation, the preceding and the succeeding.
4. Standard hourly production rates for that operation and the next.
5. The description and number of the operation.
6. The last balance to do, which is placed only on the first card for each operation and is equivalent in that case to the quantity on the order.

Time cards are made up to the extent of the number of hours required to do the work, in time increments equivalent to the number of days it takes to do the work or order. The order quantity divided by the rate determines the number of working hours required. The number of hours of work divided by the daily working period in hours indicates the number of workers' time cards needed to carry out each specific operation.

A vertical penciled line is drawn across the graphic time scale on the time card at the end of the time period covered by each card.

Standard Operation Symbol Code

A great deal of time as well as space can be saved by adopting standard mnemonic symbols for writing out operation descriptions. This saving in time is effected not only in the

actual writing out, but also in the case of interpretation when all persons having occasion to use records use the same language. Examples are: Broach, Brch; Center, Ctr. Various combinations can be made by use of (-); Burr-Bevel, Brr-Bvl. Also groups of successive but independent operations can be made up by use of (/): Bore, Chamfer, Countersink, Br/Chfr/Cs. Additions and subtractions to list can be made for special circumstances or for those required for specific departmental operation groups.

Stores Requisitions

Stores requisitions (Form 49, page 232) are made up to cover the exact quantity of raw material or parts needed to complete the order. One requisition is made out for a quantity convenient to be issued at one time—500 pounds of rod stock for automatic screw jobs, two truck loads for assemblies, and so on.

Stores requisitions are written up to show the following:

1. Order number and order and batch quantity.
2. Working place where material is to be used—this is the delivery point for the material.
3. The time the material is wanted.
4. The kind and unit of material wanted.
5. The exact quantity to be delivered.
6. The signature of the party ordering the material.

Scheduling Jobs on Control Board

The control board slides or pockets, located in the middle section and into which time cards are inserted, are always kept filled with the graphical progress strips (Form 54, page 235). These control strips are for graphical registry of progress from such reports of production as come in from the shop on current workers' finished time cards.

Workers' time cards, backed by identification, instruction, and routing cards and material requisitions, are next posted and

scheduled on the control board in the spaces taken up by the production units which are to carry out the work.

At the top of the control board, by means of cardboard, daily date cards, each of which is made a length equivalent to the shop hours on that date, shows how the regular daily working periods line up with jobs scheduled on the control board face.

Time cards to be posted on control boards, of course, must be scheduled at those places and under those dates where there is available productive capacity. The cards are placed on the control board so that they overlap each other and the left-hand edge of each one lines up with the penciled line located on the graphical scale of the preceding card. In this way the total extent of the graphical scale on cards posted on the control board indicates the total number of hours of work ahead of specific working places. That is, the order is scheduled to finish on the date wanted. The preceding operation is then scheduled to have the material ready for the completing operation. In the case of orders for assembling, all parts must be ready on the date specified.

The control board is of sufficient width to schedule 300 hours of work ahead of each production unit, or working place. Should work ahead of any specific working place be in excess of available space on the board, surplus time cards with other records which back them up are filed in proper sequence in the distribution pockets on the right-hand side or are re-scheduled to other machines.

Registering Material Available for Production

Since no production can start until the material is available, the next step is to determine this fact. The quantity available, as reckoned in terms of hours of work, is registered on the time cards with a green crayon. The minimum amount of material to be available ahead of any machine should be

standardized at two or three days' supply. If none at all, or less than the standard amount is on hand, a green signal "Watch Out—More Material" (Form 55, page 236) is posted at that point as warning and notice of need for action.

Forwarding Requisitions to Storage Division

When jobs posted on control boards are about ready to start, that is, one, two, or three days ahead, and jobs scheduled before them have gone ahead as planned, the identification, instruction, and routing cards and the material requisitions are removed and forwarded to the storage division, so as to get things ready before the current time cards have been posted on dispatch boards out in the shops.

The storage division secures the material from the storage place and delivers it to the layout place in the operating department. The identification, instruction, and routing cards are attached to the material while the stores requisition is forwarded to the control department for entry on the stores record.

Dispatching Work to Shops

Periodically, day by day, the jobs located on the control board as the next jobs to do and whose material is indicated as being available, are dispatched as the next jobs to do—that is, dispatch clerks remove from control board cards for a day's work and post them to dispatch boards located in operating departments. Thus the shop's performance is under control. The next job to do is filed in the upper clip on the dispatch board as the front card of those filed there. The practice of filing the "first job to be done" on top never leaves any question as to the sequence of working.

As soon as the next day's cards are posted to the dispatch board, the operating department foreman should review the board for his information concerning the work ahead to be done the next day. When checking up material available on the floor,

he secures the necessary tools, set-up charts, and instruction sheets from the tool crib. Knowledge as to what is required is obtained from the tool crib's file of production analysis records showing these detail data. These are placed with the material at the machine or layout places.

In addition to these jobs, he should also review work ahead on the control board from time to time. The foremen are responsible as well as dispatch clerks for making certain that all materials and tools are ready for the jobs scheduled. He should assure himself of this fact at all times.

Starting and Quitting Jobs and Registering Accomplishments

When jobs are about to start, the foreman or set-up man goes to the layout place and secures the material and tools used for carrying out the work. Material and tools for the "next job ahead" should be ready at the working place for the worker, before he actually finishes the preceding job. In this way all delays are avoided.

When an operator starts his next job, he time-stamps or writes his "quitting time" and the quantity completed on the time card for the job finished and files it in the "not yet process inspected tray" on the dispatch board. Process inspectors or foremen, as the case may be, periodically make the rounds of dispatch stations and working places and inspect and certify registration regarding accomplishments noted on time cards, placing the cards in the second tray, so that the dispatcher may secure it on his next round or trip. The operator also registers his starting time on the time card covering the job which he is starting. He places this time card, "job now working upon," in the lower of the two dispatch board clips.

Inspection Reports

Whenever parts are rejected as defective, a regular inspection report (Form 52, page 233) is made out, giving the quan-

tities good and defective. The defectives are analyzed as to possible salvaging and the reasons for defects. Inspection reports revert to the control department with the time cards, and are used for analysis of causes and for planning the salvaging work. The duplicate of the report is attached to the rejected material.

Periodically, files of defective parts are used for compiling the summarized rejection report and for the issuance of orders for salvaging such quantities as are not defective beyond repair. The salvaging orders are to be planned, scheduled, and routed in the same way as regular production orders.

Dispatchers delivering current time cards for work to do also have the function of collecting workers' finished time cards as soon as the finished work is inspected. Dispatchers, when making their periodic rounds of dispatch boards and working places, make these collections as well as check the registration of time, and available material and tools at machines. Dispatchers can anticipate changes of conditions and then check the condition on their next round. Conditions requiring the attention of the control clerk are registered on the control board by "watch out" signals (Form 55, page 236).

The dispatcher carries these reports to the control department and files them on left-hand sides of control board, opposite machines or working places which did the work.

Computations Made by Dispatchers

However, before the dispatcher files the time cards on the control board, he computes the following:

1. Elapsed time.
2. Total pieces produced, good and defective, and the balance good to do, which is noted on the next card for the job.
3. Hours of credit at the standard production rates for the operation just completed, as well as the hours of debit as represented in raw material for next operation.

Handling Irregular Conditions

Dispatchers also collect stores requisitions, inspection reports, and idleness reports. Whenever a machine or a worker is idle, foremen are required to make out an idle equipment report (Form 53, page 234) to show:

1. The unit or worker idle.
2. Cause of idleness and probable duration.
3. Starting time of idleness.
4. Suggested remedy.

This card is then filed on the dispatch board in place of the time card for the job just interrupted or completed. The time card is closed out as previously described. The dispatcher brings the report to the control board, registers the condition of idleness by means of the proper signal, and returns the report to the dispatch board from where he secured it. It remains there until the period of idleness is ended.

This idle time signal on the control board face is tagged at the time that the idleness started, and is left in place until the quitting time registration on the idle time report is brought to the control board by the dispatcher and filed in the distribution pocket with the time cards. He then removes the signal.

Any order whose regular schedule of performance is interrupted should be rescheduled as carefully and accurately as when first scheduled. It may be that the completion date may be set ahead or vice versa.

Registering on Control Board Progress on Orders

Order clerks periodically post accomplishments and duration of idle times, as registered on time cards and idle machine cards, to graphical progress scales on control board.

From time cards:

1. Hours of credit for good work completed at the standard rates of production are posted in black on progress register strips.

2. Hours of debit for good work completed, which exist as available material for the next operation, are posted in green on graphical scales of time cards. Green-colored registrations, that is, available material, are always posted on time cards since before any work can be done the material with which to work must be ready.
3. Defective material, that is, hours of work at standard rates of production spent on material which is defective, is indicated on the last time card of any order, by filling the graphical scale in the reverse direction with red crayon. This work must be repeated, providing it is possible to secure additional raw material for the operation.

From idle machine and worker reports :

1. Length of time the machine or worker was idle. This is registered in red crayon.

Posting Accomplishments to Progress and Follow-Up Records

After registrations of progress have been made on control board graphical scales, accomplishments in unit quantities, both good and defective, are registered on progress and follow-up records by progress clerk from the time cards.

When posting, the progress clerk is always alert for marked discrepancies between the actual elapsed time and the standard hours of accomplishment. Such cards are called to the attention of the production manager for investigation and, if necessary, for the revision of the standard hourly production rate or the disciplining of the worker.

Making Up the Pay-Rolls

Time cards, after these registrations have been made, are kept until all the cards for the day have been posted. Dispatchers on the morning of each day sort the time cards for the previous day by worker number and check them with clock cards. The total time for each worker must be accounted for each day, and must equal the elapsed time as shown by the clock

cards. This operation is necessary for all workers paid from time cards. Each day's cards are then forwarded to the pay-roll and cost departments for the compilation of their reports.

The time cards for the workers paid from these cards are rated and extended, and any bonus is added to determine the labor cost of the production, after which the earnings for each worker are entered on the pay-roll record. Piece-work cards may be rated in advance of the work, at the same time as the order data is written upon the cards prior to filing on control boards.

The cost department now requires the cards for making up the routine shop efficiency reports and for costing orders.

Departmental Efficiency Reports

The departmental efficiency reports are first made up. Time cards arranged by operating departments are the basis of this report. The elapsed time in hours and the hours of credit of each department's cards are added separately. Dividing the hours of credit by the elapsed time in hours gives the percentage of efficiency or ability to meet the standard hourly production rates. The total time divided by the number of cards gives the average time per job—a measure of the success in obtaining long runs. This can be better measured by the average number of jobs per worker, allowing for the continuation of any job from the day before.

Departmental Idle Time Reports

The idle machine and worker cards are totaled by departments and by causes of idleness for making up the departmental idle time reports to determine the causes and extent of idleness. This is a particularly important matter to determine for key departments when the required standard time for completing orders approaches the available machine time.

Idle time is productive of nothing but financial loss and

should be carefully watched. Its cause may be too much machine tool equipment or not enough ; but whatever the cause, investment means fixed charges and dividends must be earned on that investment.

This completes the description of graphic production control. Such control is simply definite paths and procedures previously planned out and to be followed at certain scheduled rates. Such foresight is in contradistinction to usual methods where efforts are spasmodic and scattered and results are obtained in haphazard fashion.

PART IV
PROCUREMENT BY PURCHASE

CHAPTER XX

THE FUNCTION OF THE PURCHASING DEPARTMENT

Preliminary View of the Purchasing Department

The purchasing department is a comparatively new factor in business organization. Its general adoption reflects changing conditions in purchasing and an increasing realization of the important part played by good buying in the success of any business enterprise. There are many large concerns, however, which still persist in the old method of departmental buying.

As the practice of exact cost-keeping becomes more universal and the dislocation due to the war becomes a memory, prices will become more and more stationary. The prices quoted by most responsible firms are no longer tentative prices purposely placed high to provide a margin to which a discount can be applied or that can be cut down by the purchaser without destroying the profit. Exact knowledge on both sides is increasingly taking the place of persuasive methods. The modern purchaser as well as the salesman knows his goods and frequently the purchaser is the better informed of the two. More is demanded of the buyer today than such mastery of the essential psychology as makes it possible for him to drive a satisfactory bargain. He must have the requisite technical information required for the solution of his purchasing problems, and the accumulation and maintenance of this store of knowledge is possible only in a functionalized department of highly paid specialists, devoting all their time to the work of purchasing.

Defects of Departmental Buying

Whatever are the apparent advantages of the older method of entrusting this important function to the individual department head, they are vastly overbalanced by its disadvantages. The department head knows what he wants, but here his qualifications for the task of purchasing usually end. Almost anyone can place an order and secure a delivery if the market conditions are normal. It is in determining the proper price and selling terms, and in securing delivery when the market is the least bit tight, that the untrained buyer is at a distinct disadvantage. The individual department head is seldom equipped with the necessary knowledge of market conditions. Records of previous quotations and purchases alone do not enable him to determine whether the price quoted is reasonable today or whether it will not be excessive tomorrow. He does not appreciate the accumulative value of advantageous discounts or the importance of those elements that insure prompt delivery. He does not realize the value to the business as a whole of advantageous relations with vendors. He fails to see the relation of his purchases to the activities of the entire organization. He has necessarily a narrow view, limited to the interests of his own department.

Most serious of all, the department head generally fails to realize that buying, like selling, is an art as well as a science. When a mere order giver is brought in contact with a salesman who is something more than an order taker, the former suffers from a handicap of which he may never be conscious but which will inevitably be reflected in the expenditures of his department. The salesman is a specialist. He knows the conditions of his market, he knows his products and his competitor's products, their strong and weak points. He holds his position by virtue of his ability to make the purchaser want what he has to sell. The more important the purchase to be made, the more capable is the salesman sent to effect a sale and the less the chance the

occasional buyer has of holding his own in concluding a reasonable bargain.

The mere element of time taken from the productive and executive work with which the department heads are especially concerned bulks large in the aggregate. When promiscuous purchasing prevails, much of the time spent in the details of purchase transactions is profitable only to the salesman. For the active head of an important department, it represents a misappropriation of time which alone goes far to justify the creation of a distinct purchasing department.

Specialized Purchasing

It is coming to be generally realized that the specialization of the purchasing function is a vital necessity to every enterprise. To install a purchasing department, a group of professional buyers is organized, who understand and appreciate both the problems and difficulties of the purchasing function and the needs of the departments which they serve. To this department will come both the specific requests of the control department for material and supplies which must be purchased outside, and the technical questions regarding what the market offers in a variety of materials. For the content of the purchase requisitions or requests for information, the purchasing department is not primarily responsible. It is its function to get: (1) what is wanted, (2) when it is wanted, and (3) at the lowest possible price—consistent with the quality demanded for the particular purpose for which the material is sought.

The Purchasing Agent

The selection of a purchasing agent, the man who is to direct the department, is of the highest importance. It is no longer sufficient to pick any bright man and "give him a chance." A man who has been specially trained must be selected.

| Today the purchasing agent has become a constructive force

in his organization. He is a student of the market, with a definite and timely knowledge of its trend in every leading commodity. He is a keen judge of commercial conditions. He knows the details of transportation and the constant changes in rates that play such an important part in ultimate costs. He knows the standing and character of the firms from which he buys; which are reliable and which must be closely watched. He knows all there is to know of the financial and production conditions of his own firm, and he correlates his purchases if they are extensive with the credit fluctuations of the seasons. Such a man commands an excellent salary, but if he be truly competent he will save it many times over in the course of the year.

Increased Profits through Savings

The properly organized and properly operated purchasing department is not an added expense. It is, on the contrary, one more of the fruits of scientific management directed to the reduction of costs. This country during the last decade has passed through a period of unexampled expansion. Intensive efforts along the lines of salesmanship have brought commercial expansion in many lines to the limits of the available market. Sales and profits have been limited only by production capacity. Today, however, many concerns are approaching a point where the future increase of profits must come from economical administration and from savings in every department rather than from increased sales. Shorter hours, increased cost of materials, an ever-mounting cost of doing business, to say nothing of the inevitable salary increases in every department—all emphasize the necessity of reducing costs. The task of retrenchment may begin in the work of the purchasing department, rightly organized and correctly operated. There was a time when the cost of labor was the largest factor in the production cost of most products. The cost of the raw material

was relatively small and all effort was concentrated in reducing the labor cost. This led to the adoption of automatic machinery and of other labor-saving devices. But today direct materials form a larger proportion of the production cost than before and must be closely reckoned with, while "burden," the third element of costs, is largely made up of expense materials, as illustrated in Form 3 (page 29). To reduce material costs is just as important a matter as to reduce the labor costs—and it is here that the purchasing department becomes one of the chief factors concerned in the increase of profits through savings. The success or failure of a commercial organization is often the direct result of good or bad purchasing.

Good Buying

Good buying does not mean necessarily purchasing at the lowest market price. The purchasing agent who sets out to make a record for himself, to "show results" regardless of any other consideration, reveals himself as a man of narrow vision, deficient in qualities that make for success in this work. Good buying means rather that the purchase has been made with accurate foresight, at the lowest possible price consistent with the requirements of the requisition. It implies an intelligent understanding and an exact knowledge of the materials, manufacturing processes, market prices, sources of supply, trade customs and usages involved, and the interrelations of purchasing with the other activities of the organization. Poor buying, on the other hand, is promiscuous and haphazard. It may be intuitive, based on rumor and guess, a gamble in which the buyer sometimes wins, but sooner or later inevitably must lose. Or it may be exceedingly conservative, following a settled course and making little use of readily available information. In either case the buying is unscientific and likely to result in loss.

Before we can approach a standard of purchasing that can

be called good buying, a general knowledge of values must be supplemented by the more specific knowledge of conditions. This knowledge the efficient purchasing department will have collected and so tabulated as to have constantly available. When any transaction is compiled it should be possible to check up and to justify any detail with accuracy and precision.

Records

It is by virtue of its record that the efficiency of a purchasing department may be largely judged. To a large extent they will be the detailed tabulation of its experience. They will include the complete listing of past orders, showing at a glance the sources of supply, the prices, the selling terms, and everything else that will make possible the duplication of the order and indicate whether or not an exact re-order is advisable.

Besides this specific information, the purchasing department should be the repository for the general information that will determine such vital questions as when large orders for material can be placed to the best advantage. The answers to such questions depend upon the condition and trend of the market. One cannot afford to guess or gamble but must call into consideration every bit of available data on every factor that has a bearing on market conditions. To this end the purchasing department may concern itself with the collection and compilation of detailed statistics of at least a few basal commodities. This work under proper supervision soon becomes a matter of routine but its value is cumulative.

As a part of its record-keeping function, the purchasing department will also be called upon to collect, classify, and index catalogues and informative advertising matter with which it comes in contact. The value of technical catalogues cannot be overestimated. They are not only a source of specific facts, but they are veritable mines of useful general information which should not be overlooked. While they are primarily adver-

tising mediums, the spirit and policy of modern advertising makes them usually reliable; their statements can generally be taken without discount. Perhaps most important are the price lists of every concern with which the department does business or by whom it is solicited. Books and periodicals pertaining to materials should also find their ultimate place in the purchasing department, unless the organization maintains a special business library.

Contact with the Outside

In its contact with the commercial world the purchasing department, to an extent equaled only by the sales department, has in its keeping the good name of the firm. On its treatment of the many concerns with which it deals, the reputation of the firm for fair dealing, courtesy, precision, promptness, and reliability largely depends. In its handling of disputes which are bound to arise, the need of a consistent and sound policy and method of procedure will be evident.

The business relations of the purchasing department with outsiders are usually covered by agreements in which the vendor is bound by a legal tie. The legal rights of a purchaser are usually adequately secured by the written terms of the contract, but the numerous little details of service, slight in themselves but large in the aggregate, are obtainable only to the extent that the vendor wants to render them or thinks it expedient so to do. It rests with the purchasing agent to establish and maintain with his vendors a relationship that will make them want to do business with him and eager to meet his every wish.

Personal Relations with Vendors

The purchasing agent who elects to keep salesmen at arm's length and to disregard the value of personal relations may sacrifice more than he gains. The human element in business cannot be disregarded. The man who knows how to capitalize

it will always have a great advantage over the man who ignores it. Business is business, but friendship is not without a legitimate place in business relations. Every man can best judge his own contact along these lines. He must not allow friendship to influence his business judgment and he must know to what length he can safely allow personal relations with selling agents to go, without affecting his decision. It would seem that a broad-minded purchasing agent could safely give friendship as readily as it is offered and have no difficulty in determining its limits. Kindness, courtesy, fair dealing, frankness, even when they are used to inform the salesman that he has lost the order, all inspire friendship without sacrifice of anything on the part of the buyer. Their small expenditure not infrequently brings large returns. Thousands of dollars have been saved to buyers by the advance information given them by friendly selling agents relative to market conditions and future price changes.

The wise purchasing agent will seek the good-will of selling representatives as much as his own good-will is sought. He will speak well of them so far as possible in his correspondence with their employers and he will make it his business to see that they receive credit for all sales effected through their efforts. He will show them and their employers that his business can be secured in fair competition on the basis of price, quality, and service and that they will receive payment without undue delay. In short, he will appreciate the practical advantage of causing himself to be considered as a valuable customer. The desire of the salesman to meet the wishes of a house whose good-will and whose trade he values and of a purchasing agent whom he likes and therefore wishes to help is an advantage in buying, which should be fostered.

On the other hand, no buyer can afford to rest under the suspicion that he can be influenced by the direct or indirect acceptance of gratuities. Such a suspicion will offset all the advantages that he may have built up along the lines suggested.

Then neither he nor his house can be regarded as desirable customers. The good-will which is of such value and advantage will give place to mutual suspicion and distrust from which all parties concerned will suffer.

Justifying Its Existence

If the purchasing department is to justify itself, it must do all the good that the individual buyers have done in the past and at the same time overcome the evils of the old method. It must clearly demonstrate its superiority by performing more efficiently its essential functions.

There are, at least seven factors which every purchasing agent must have constantly in mind in determining his purchase if he is to make the selection that will at once satisfy his consuming department, the treasurer, and the best interests of the business :

1. He must be sure that the article selected is perfectly adapted to the use to which it is to be put.
2. He must satisfy himself that its quality meets the specifications of the requisition.
3. He must be sure the quality is uniform throughout the shipment.
4. He must purchase it at the best price consistent with the requirements and on the most advantageous terms.
5. He must be confident that he can effect the delivery on the date on which the purchase will be required.
6. He must determine the proper quantity to meet the current needs, with due regard to the seasonal demand and supply.
7. He must obtain a guarantee of stated prices for a fixed period and, if possible, protection against a decline of prices during the period carried by the agreement.

The Seven Stages of Purchasing

When the purchasing department functions, its work develops through seven distinct stages which occur in the following order :

1. Determination of the articles.
2. Learning what the market offers.
3. Selecting the vendor.
4. Determining the price.
5. Making the contract.
6. Effecting the delivery.
7. Completing the contract.

1. Determining the Article

In this stage the attitude of the purchasing department is somewhat passive. While it may suggest changes, the order requisition which gives rise to the purchase order comes as the expression of a specific request of another department head or by reason of the depletion of stock. This requisition may call for a supply of any standard material to be obtained by purchase. It is the work of the purchasing department to secure it. The purchasing agent may properly question both the quality and quantity requisitioned, but he cannot make any change without the approval of the requisitioner. When the purchasing agent has asked and received the confirmation of the department head or of a higher authority regarding any questionable details of the requisition, it devolves upon him to secure what is wanted; responsibility for the details of the requisition is no longer his.

In appealing from the detail of the requisition the purchasing agent must be sure that he will not subject the requisitioner to delay or inconvenience. Time is often a most important element in the case of purchases. The failure of materials to arrive promptly may destroy the entire working schedule of the factory. The routine should proceed, if necessary, to the point of placing an order with the privilege of cancellation later. It must be assumed that the materials called for under the conditions specified in the requisition are demanded in good faith, that the material ordered is just what is needed, and that the delivery time named is the exact time at

which this material must be available if the schedule of operations is to be followed.

2. Knowing the Market

The purchasing department must at all times know what the market offers. This is a point, in connection with the problem of determining the proper article, in which the purchasing department can function very actively.

It is the business of the purchasing department to inform itself regarding all new materials as rapidly as they appear in the market. In this, salesmen become of real educational help. The trade papers usually offer the first information of the appearance of a new product. Such information should be collected by the purchasing department and at once referred, not to the user of the older standard, but to the authority who may direct the substitution of the new one. It is one of the faults of the older system of departmental purchases that the department head frequently is more willing to defend his present standards than to experiment with new ones. The delay, inconvenience, and expense involved in such changes, the immediate disadvantage to gain a problematical future advantage, the influence of natural conservatism, and the tendency to let well enough alone—all operate to discourage such experiments and ultimately to retard progress.

It is the function of the purchasing department, which is affected by none of these considerations, to call attention to the new article, to arrange for its demonstration, to know the result of the trial and the reasons for its rejection if it is not accepted, and to give the producer an opportunity of adapting it to the needs of the organization if such a course be practicable.

3. Selecting the Vendor

In addition to knowing what the market offers, the purchasing agent must know the vendors. Among them he must

be able to make such a choice for trading purposes as to avoid the losses in time, money, and efficiency that come from the selection of the unreliable vendor. The vendor who will not or cannot meet his contractual obligations should be known. The results of his failures are borne ultimately by his customers.

The records of the purchasing department will contain the names of several reliable sources of every kind of material which may be demanded. Of every one of these sources the department will have complete information along several lines of inquiry. There will be a complete record of past transactions showing the nature and quality of the services rendered by each vendor. There will be a record of his financial standing, the capacity of his plant, his relations with his employees, his shipping points, and his transportation facilities. Every new vendor whose offers are seriously considered will be similarly investigated and recorded.

These records will determine the selection of vendors who will be asked to submit bids. When the various bids are tabulated they may be again consulted. This study will enable the purchasing agent to go beyond the mere quotation. By a careful weighing of the quality of each product, by considering the quality of the service that each vendor has rendered in the past and may be expected to furnish in the future, and by taking into account the resources, the reliability, and the general character of each, the purchasing agent is in a position to make his selection with intelligence.

4. Determining the Price

The chief function of the purchasing agent is not to beat down prices but to render service. His obligation to obtain his materials at the lowest possible cost cannot be disregarded, but the outcome of his effort in this direction does not necessarily reflect the success or failure of his department as readily as do two other factors: selecting the right articles, and securing

prompt delivery. Purchase price is nevertheless of great importance. Every cent added to the cost price is a cent deducted from the net profits and is likely, sooner or later, to be reflected either in the quality of the product put out, or in its selling price.

In determining what is the best price, the purchasing agent will have considered the selling terms, cash discounts, f.o.b. point, and other similar factors. The purchase cost of a single article, unless very large, is frequently lost sight of in the total cost of a project. Questions of general policy and the interrelation of many factors all have their bearing in determining the selection of a commodity and tend to minimize the importance of always giving the order to the lowest bidder.

The purchasing agent should be recognized always as the sole authority in the matter of price. The tendency of salesmen to quote prices to department heads should be ruthlessly suppressed. While the purchasing agent is no longer selected solely because of his ability to "dicker," he may still find a fertile field for this kind of action in dealing with competitive prices. He will seldom place an order without comparing recent prices or obtaining bids from two or more reputable concerns, each of which is able to fill such orders as may be obtained. While such quotations should be standardized as far as possible by the specifications of the contract desired, they should nevertheless be subject to the closest scrutiny, especially if they vary widely, in order to ascertain that the bidders are figuring on a similar basis of costs. A particularly low bid should always call for considerable scrutiny, not only to determine the basis on which it was made, but to ascertain the standing of the firm and its ability to fulfil a contract.

There is an increasing tendency on the part of manufacturers to present a single price, and that the lowest which it can afford to accept. Since costs are more accurately figured than formerly, the vendor knows what he can do and how far he can

go. He is less willing than formerly to do business at cost for the sake of prestige, or to risk a loss by bidding too low.

The buyer, on the other hand, has his tabulated information as to sources of supply, his records and prices which he has carefully prepared and on which he will largely rely. The trader's instinct is being gradually subordinated to exact knowledge as the old-fashioned persuasive drummer, who talked in generalities, is giving place to the scientific salesman who knows his goods. Nevertheless there is a danger of becoming too mechanical and automatic. There are moments when intuition and insight are worth more than classified information and preconceived rules of procedure. The modern buyer cannot afford entirely to disregard his native shrewdness and common sense.

5. Making the Contract

The detailed discussion of the rules and methods to be followed in making the contract may be postponed until a later chapter. It is sufficient to state here that the mutual contractual obligations should be stated in a manner that is clear, exact, and comprehensive. Every oral contract should be confirmed in writing and the purchase order form with its accompanying conditions and rules of procedure, when acted upon by the vendor, will constitute a contract that will be sufficiently binding. Changes in the original order that has been confirmed by the formal acceptance of the vendor, should be provided for by a similar form to be similarly accepted. With these qualifications the original written order and its acceptance may be considered as a contract irrevocable except by mutual consent.

Where the time element is of particular importance, the buyer should provide for the privilege of cancellation of his order in case of failure to deliver promptly, and sometimes it may even be necessary to include a penalty clause providing for the forfeiture of a part of the purchase price if the delivery is not on time. On the other hand, the buyer always has the

right to refuse to accept material at a premature date and such a refusal does not exempt the seller from making his delivery on the date agreed upon.

6. Effecting Delivery

Having placed its order, the purchasing department must see that the materials are on hand when desired and are delivered as contracted for. To this end it must maintain a watch both on the producer and on the transportation agencies, by means of an efficient follow-up system. Here its ability to command service, through the standing of the organization as a desirable customer and the personal good-will which the department has assiduously cultivated in its dealings with the vendors and their representatives, becomes a factor of importance. By means of it, sometimes, the seemingly impossible may be accomplished.

On the other hand, the natural desire of the vendor to accommodate his customer may be dissipated by a tactless purchasing department. The petty annoyance occasioned by a continual and too vigorous following up of the vendor before he has had a reasonable time to effect his delivery should be avoided. Both the buyer and the seller are seeking all the profit possible. Each should understand the other's difficulties and recognize that their mutual advantage lies in friendly co-operation.

7. Completing the Contract

In making his contract with the vendor, the purchaser has implied that he will give, in addition to the money consideration, a certain amount of service in return for the material and service rendered by the vendor. The vendor completes his part of the contract when he delivers the goods. The purchaser has yet to complete his part. Before the bill can be paid the goods must be checked, the invoice sent through a

certain routine, and finally certified and sent on for payment. In the prompt and faithful performance of this service the purchasing department expedites payment, upholds the credit standing of the organization, and wins the good-will of the vendor. Its ability to do this depends largely on a definite plan of procedure.

The Purchasing Department and the Organization

The purchasing department, like the stores department, is a functionalized service organization which is in direct relation with every department of the organization. In Form 2 (page 20) is shown its place in the organization. Its head, while responsible to the works manager as the director of production, is on a level in authority with each of the general functional managers. With these officials and with heads of departments in both office and factory, the purchasing agent must be in close co-operation, familiarizing himself with their needs and their problems.

The efficient purchasing department must be eternally vigilant, it must avoid ruts and the rule-of-thumb, it must be conscious of every trade wind that blows and alive to every opportunity that offers. It must function smoothly and promptly. To a greater extent than any other department it must "carry the message to Garcia." When it cannot find a way, it must make one. Its improvement over the old system of random buying, in its savings, in its range of interests, in its exact knowledge, and in its smooth operation, is so evident that its existence is abundantly justified.

CHAPTER XXI

THE ARTICLE

The Selection of the Right Article

Before any business can begin its work, and as long as it continues in operation, it must be provided with materials and supplies. The selection of the right article then becomes the first subject of our consideration, not only in point of time but in its degree of importance.

The determining factor in the selection of the article must always be its precise suitability for the purpose for which it is purchased. If its grade is either inferior or superior to the needs of the case, the finished product will suffer. In the one case the quality will be impaired; in the other the cost will be too great. At times the success of the production program is absolutely dependent on obtaining precisely what has been ordered, and any failure of the purchasing department to obtain it or any attempt to substitute may result in confusion, delay, and perhaps the complete demoralization of the production program.

Quality versus Price

Quality—the exact grade, size, or weight required—must always be placed before price in selecting the article. Price is important, but the unfortunate results of a deviation from the standard requirements may soon offset any saving in cost.

The substitution of an article of slightly different size may result in the necessity of the manufacturing department having to reshape the purchased article before using it. Or again, in machining a part from, say, a 2-inch piece of steel, the cut

may be just sufficient to allow simply for proper finishing. Although the saving in cost be considerable on a job lot 1/16 inch larger in diameter, the time consumed in more machining to secure the desired size and finish may offset the saving in cost or result in an actual loss. The habitual refusal of producing department heads to sacrifice quality and suitability for price considerations in those organizations which allow the department heads to purchase what is used in their own departments is one reason why decentralized purchasing so often appears to be the better method.

While the quality can never be safely sacrificed, price can be sacrificed often with an ultimate advantage. When the right article has been selected the result is perhaps that a frequent cause of delay in production is removed, the chance of producing an unsatisfactory and possibly unmarketable article is reduced, and the cost of production is cut. Thus, what originally may have seemed extravagance in the price paid for materials becomes an economy. The selection of the article best suited for the purpose is the first consideration, and the price that is paid for it must always be of secondary importance.

Essential Knowledge

If a purchasing agent is to make an intelligent selection of the required commodity, he needs to know: (1) the use to which the article is to be put, and (2) what the market offers.

The extent of his knowledge is the measure of his qualification for his particular task. As a rule the head of a centralized purchasing department is better qualified in the commercial aspects of his work than in its technical requirements, but if he is awake to the demands and the opportunities of his position he will neglect no chance to educate himself and to eliminate his shortcomings.

Contact with the department heads, visits to consuming or

manufacturing departments and shops, the study of manufacturing operations by following the processing of individual materials—all will better enable him to appreciate shop problems and material requirements. His dealings with salesmen and his study of catalogues and technical books and journals will be prolific sources of market information which will supplement and confirm his personal observation and first-hand study and research.

The Use of the Article

If materials control is well organized along the lines that have been suggested, the standard material best suited to any given purpose will have been determined. (See Chapter XII.) In these determinations, the purchasing and often the engineering department should be freely consulted and allowed to play a leading part. The resulting specifications which the purchasing agent receives will describe what is at least theoretically the best article. Even then, various contingencies may arise which make it desirable for the purchasing department to have an exact knowledge of the use to which the article is to be put. If the article has not been previously purchased, the specifications may be incomplete and it will be necessary for the purchasing agent to continue his study of the market until he finds what best suits the needs of his company.

Material will often be suggested as a substitute for a previously determined standard. Then his knowledge of his requirements will enable him to determine at once whether the new product or new quality is worthy of consideration. Such knowledge will save time in dealing with salesmen who offer material of whose utility to the plant they are uncertain. It will enable him to show unsuccessful bidders the unsuitability of their offerings for the use of the business, and to convince them of the fairness of the award should such a post-mortem be considered expedient.

When materials control is not well organized, it becomes increasingly important for the purchasing agent, who must then often personally choose the article best suited to the particular requirements, to be well posted as to the manufacturing processes of his own plant, and to be in close touch with the heads of his production departments. He cannot be omniscient, of course. He will realize that to a great extent he must fall back upon the technical departments of his organization for advice. He may, however, become increasingly self-reliant by familiarizing himself with every process and mastering every scrap of information that may be conceivably of future value to him. One chief object in functional organization is to avoid the too close drawing of departmental lines which limit too narrowly the executive responsibility. It is the duty of the purchasing agent to know whatever will assist him to determine the article which best meets his need. To this end it is his further duty to consult those who can throw light on his problem.

Questionable Requisitions

It will often happen that the purchasing department receives requisitions that are obviously in error in the quantity or quality of the material requested. Theoretically the purchasing agent is justified in filling the request as he received it. Perhaps his relations with the requisitioner are such that he does not care to question his requisition. Perhaps he is secretly not unwilling that an unamiable department head should suffer from his own carelessness. If the purchasing agent yields to such inclinations he proclaims his own limitations. He himself should be held responsible for a large share of the blame if he allows any questionable item to be filled without the confirmation of the requisitioner. He should go even further. If he still questions the accuracy or judgment of the department head after the requisition is confirmed, he

should carry his appeal to a higher authority. Only then has he absolved himself from any further responsibility for the data furnished him.

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Technical Knowledge

The buyer should know all of the variations of each kind of material. He should know their physical properties or chemical analysis. He should be familiar with the processes of their manufacture and with the factors on which their costs and deliveries depend. If he is to buy steel he should know the properties and the processes of manufacture of all kinds of steel and iron as well as of the particular grades of steel that he is to buy. He should know the costs of production, on what factors quantity production depends, the source of raw materials, and whatever might affect the supply in the immediate future.

All of this information is a part of the expert buyer's stock-in-trade and gives him his right to his title. Strip the buyer of his technical knowledge, and he becomes merely the commercial agent whose function is to collect data, to close the best bargain he can in the light of those facts, to effect the delivery of his purchases, and to complete the contract by verifying the vendor's invoice. To the extent to which the purchasing agent can bring to his duties a store of technical knowledge and a scientific grasp of his problem, to that extent he adds to the importance and dignity of his calling and to the intelligence with which he performs his task.

This technical information is put into practice whenever the purchasing department goes into the market or prepares its purchase order. Unless the buyer specifically defines the materials sought in terms which cannot be mistaken and which cannot be taken to describe any other article, the vendor will have the opportunity and the right to ship anything which falls within the limits of the general trade term by which

goods are ordered. It is necessary, therefore, in ordering, to prepare a specification which will clearly define the limits within which the goods must fall to be acceptable.

Specifications

The following abstract from the annual report of the Director of the Bureau of Standards aptly summarizes the situation :

A standard of quality for a given material may sometimes take the form of a sample of that material with which other materials of the same kind can be compared, but this is generally a makeshift of the poorest sort. It is only resorted to in the absence of definite and reliable specifications in terms of measurable properties; that is to say, a standard of quality of a material usually takes the form of a specification or definition of its properties, involving, of course, the measurement of these properties by means of the usual standard of measurement.

The questions then arise: Why is it good or poor? What are the physical or chemical properties or the particular combination of elements which make it of good or poor quality? How are its properties to be measured or its constituents determined? These are questions for the laboratory to answer and involve physical and chemical investigations of the most difficult sort.

A standard of quality for a given material necessarily takes into account the purpose for which the material is to be used. To set the standard too low results in losses, poor efficiency, and even loss of life; to make it too high may result in precisely the same thing; that is to say, the material must be suitable for the purposes intended, and the United States Bureau of Standards' investigations in connection with the properties of materials are to enable the user of these materials, first, to select intelligently the material best suited for the purpose; second, to specify it in terms which the producer cannot mistake; and, third, to make the necessary tests to ascertain whether or not the material supplied is in accordance with the specifications.

The subject of correct specifications has been called the most important element in purchasing. Some material is recognized by the use of ordinary commercial terms, and detailed specifications and drawings are hardly necessary. However, the more frequent the purchases of a given commodity, the more essential specifications become. With important purchase contracts covering important materials and special machinery or equipment, however, the procedure must be completed. Such material must be fully described in detailed technical terms carefully prepared in advance by the technical experts of the plant, and upon its receipt it must be subjected to the special tests of the technical inspectors before it is accepted. In view of all that is involved, such specifications cannot be too precise in their wording or too detailed in their scope. On the other hand, they need not, of course, be made up individually for every article needed. If a concern uses fifty different sizes of one grade of steel, a single technical specification will cover all of the fifty requirements.

When a purchasing order is sent to a vendor the specification should either be written in the body of the order, or a clause should appear in the contract to the effect that the material is to be "in accordance with specification number — which is attached and which forms a part of this contract." Typical formal specifications as used by the United States Government are shown on pages 151-153.

Classes of Specifications

The writing of formal specifications has already been covered in Chapter XII, "Standards and Specifications." It remains now to inquire as to the characteristics of contracts with which specifications are used.

Specifications may be divided into two classes, the second of which may be subdivided:

1. Those used with purchase order contracts for standard materials and current requirements of materials regularly purchased. These specifications are not usually required to be formal, but may be trade descriptions, etc., embodied in the body of the contract.
- 2a. Includes those used with future requirement contracts or contracts of broad scope for these same or for similar materials but which require formal specifications based on technical or engineering data to save confusion at some distant time of delivery.
- 2b. Includes those used with purchase order contracts for mechanical equipment, unusual materials, plant betterments, and extensions, special equipment or apparatus requiring specifications of a very exact engineering or technical character.

It will be understood that there can be no final division of the commodities purchased into these two main classes, inasmuch as general business conditions, conditions within the industry itself, or conditions in one or more outside industries, may or may not make it desirable to make a large number of future requirement contracts.

For example, a purchasing agent who had made a future requirement contract for pig iron, or as a matter of fact almost any other commodity, during 1915 or 1916 and 1917, was in an extremely fortunate position providing he could get delivery, because of the fact that during those years commodity prices advanced steadily. On the other hand, a future requirement contract for pig iron for delivery during 1918 was of little advantage during a part of the year, owing to government price fixing and allotment. No matter how legal his contract or how pressing his requirements, he could not get the iron without authority from the proper bureau in Washington. While during 1914 to 1918, the far-sighted purchasing agent made as many future requirement contracts as he could, consistent with his need, at the time of the signing of the Armistice the wise ones would make no future requirement

contracts, except to take advantage of quantity prices, and then they endeavored to insert a clause in the contract protecting themselves against a decline in prices. Today most of our contracts fall within class 1, that is, they are in the form of purchase orders for material required for current use.

Materials from Vendor's Stock

All material under 1 does not require the use of detailed specifications. Bolts, for example, can be easily defined by terms which are known to the trade. By using trade terms it is possible to buy any kind of bolts desired. They have been manufactured in exactly the same way for years by a number of different companies. The qualities and the sizes have become standardized. It is the purchasing agent's business to know qualities and sizes; the knowledge belongs to the elementary part of his equipment.

Oil, on the other hand, is usually sold under brand terms and without standards of quality. Having determined the use to which it is to be put and the properties it must have to fill adequately the need and knowing the properties of various kinds of oils, the buyer can specify the brand of oil which chemically and mechanically will meet the requirement. The value of coal depends entirely upon its heating possibilities. Hence it may be purchased on a b.t.u. basis with a specified limit as to the percentage of waste. In the purchase of materials of this nature, whose quality does not appear on the surface, the danger from competition enters. Each dealer may safely assert that his product is superior to any other and better meets the requirement—statements which are not to be taken as fact until proved by the consumer's analytical tests. Here one must proceed by specifying coal according to the limits of volatile matter, ash, sulphur, etc., and testing each carload by the analysis of samples. The use of ambiguous terms such as pea, nut, or stove in specifying size of coal is

taking a chance, for what is pea to one vendor has been another size to a second vendor.

Materials Record

Since every executive finds himself more and more dependent on his purchasing agent for technical knowledge along certain lines, the keeping of a detailed record of each important class of material is a matter of great importance. The sudden loss of a purchasing agent may become a very serious matter unless he has had his accumulation of knowledge tabulated. On the other hand, such a record will make the purchasing agent increasingly independent of his expert advisers in the organization. It will strengthen his own hand by making him sure of doubtful technical details, and will strengthen his strategic position as an expert buyer whose stock-in-trade is his knowledge of what the market offers. While no one expects him to be an expert in all lines, the materials record will go a long way towards making him one. It will also be found very useful in answering inquiries from other parts of the organization, such as the engineering department, regarding what the market offers in the way of standards and their relative costs. When requisitions for special materials are received, he has a fund of information at hand showing at a glance the possibility of finding the materials in the market. All the technical information that comes to the purchasing department, especially that which deals with the different variations of material that can be secured and the relative variations in cost, will find their proper place in the materials record.

On account of its varied nature and the fact that the data on no two commodities will be the same, the record cannot be maintained on a form. Instead of the use of a standard method of compiling the data, a narrative of the matter will be found useful. The possible quantity of data on any phase

of one commodity will differ from every other, hence the discussion affords sufficient possibilities of inclusion to suit any statistician. The original record will probably be a dictated and typed statement of fact. This can be placed in a standard-sized letter file folder, with additional data as it comes to hand from time to time, and copies of all subsequent specifications applying to the particular material. After a while the original story of the commodity can be revised, corrected, and rewritten to incorporate the facts discovered later.

An Illustrative Record

The nature of this record is partly specific and partly general. The use and character of the record can probably best be shown by one specific record pertaining to paper :

- TRADE NAMES :** Book, writing, kraft, manila, news, bond, ledger, laid, etc. If sizing is added to book paper when in process it becomes writing paper. When a different kind of sizing is added and it is given a special finish, it becomes cheap bond paper, etc. All kinds are usable for printing purposes. The grade to be used depends upon the use to which the printed matter is to be put.
- FINISHES :** Book paper with a special water-marked finish is laid paper. Linen paper is bond paper specially finished; etc.
- COMPOSITION :** The cheapest papers are made from wood pulp; the best from new rags. There are many intermediate mixtures. Grades of "all-rag" papers vary according to the grade of rag used, and some mixed papers are better than low-grade "all-rag" paper.
- SUBSTITUTION :** Kraft and other coarse papers when well finished, although not so attractive, can be used as substitutes for more expensive bonds in practically any case with a great increase in strength.

SIZES:	17 x 22 and 22 x 34 are the most common and easiest sizes of bonds to secure on the market; the other grades have different best-known sizes. Special sizes increase the price over that for standard sizes, but they usually can be secured at no additional cost when ordered in lots of four cases.
QUANTITY PRICES:	If ordered in case lots, about 500 pounds, the cost is approximately 1 cent less per pound than in less than case lots, largely due to saving in packing, etc.
SPECIAL WATER-MARKS:	Special water-marks with a high advertising value can be secured with no additional cost if a sufficient quantity is ordered.
CONTROLLING PRODUCTION FACTORS:	The scarcity of water in the seasons of draught which often visit New England may tie up production and deliveries because of the large amount of water required in paper manufacturing. A scarcity of wood pulp, most of which is imported, raises prices and effects delivery. In an advancing market, the cheaper the paper, the greater the rate of price increase.

This and much similar data is information which a salesman does not readily give, especially if he is attempting to sell a product which can be replaced by another vendor's product to the advantage of the purchaser. It becomes a difficult proposition to get from the salesman information of this character for inclusion in the record or in making an actual purchase, but the data can be obtained somewhere in every case. With an adequate record of this kind a new purchaser could buy with more ease and without showing his real ignorance of the subject. The record would supply many of his deficiencies.

This information should be recorded in concise form, for every kind of material which the purchasing agent may be called upon to supply. The record should include all available

newspaper, trade and technical paper clippings, salesmen's hints and the buyer's experience. Such information will make it possible for the purchasing agent to delegate his functions to a subordinate with the assurance that without special knowledge and training he will have at his disposal the leading facts concerning the desired commodity and can proceed with intelligence.

Origin of Purchase Order Requisitions

It may be well to diverge at this point to obtain a brief picture of the procedure of the purchasing department in handling an order which is governed by standard specifications previously determined.

There are two general theories in regard to who should be allowed to write purchase order requisitions. Some contend that any member of the organization should be allowed to write requisitions for materials which are not stocked. Others say that only the materials control department should write requisitions.

Under the first plan anyone desiring material must first determine if the material is stocked or not, and if not, whether it would be purchased or manufactured, what is considered the organization's standard for that kind of material, and the proper quantity to order. The second plan considers it a waste of time to bother the one desiring material with details in which he is not interested. If for the sole sake of easing him of the detail, let him write a stores requisition for the material, stating what he wants and when he wants it, and let him send the requisition for the material to this service department of specialists who write most purchase order requisitions and who know how to handle those matters and to carry them through to completion. In a large concern, he is more likely to get better service.

By the first plan, the contract with the purchasing depart-

ment is more direct, only one paper transaction takes place, and the accounting is somewhat simplified. This plan is the one illustrated in the routine in this text.

Checking

On receipt of the purchase order requisition (Form 57) calling for material already standardized by definition and specifications in the records of the purchasing department, it will be reviewed by a clerk.

The requisition clerk will see that it is signed by the proper authority, that it is correctly dated, and that it carries all of the required information. Most important of all, it is essential that the material be clearly defined and identified with any specifications which may have been placed on file or are attached to the requisition. If the requisition fails to meet these requirements, it should be returned to the originator for correction. If the material requested does not conform to the standard requirements in every particular, it must be made to do so. To this end a conference with the head of the ordering department may be expedient, because usually such head will not be permitted to depart from the standard specifications in framing his requisition without the authority of a competent superior. But on occasion the purchasing agent must not hesitate to fill a requisition of this kind even without confirmation by a superior, unless he is willing to take the responsibility of causing delay and inconvenience to the ordering department.

Use of Data

Having checked the requisition, the clerk must next compare it with his materials record and other records and review the available data bearing on the commodity in question. With the additional data of the requisition he should be prepared to proceed intelligently in selecting the proper article. When and where to get it most advantageously will be discussed later.

PURCHASE ORDER REQUISITION NO. 25003									
TO PURCHASING DEPARTMENT					DATE WRITTEN _____				
PLEASE SECURE THE FOLLOWING MATERIAL BY _____									
QUANTITY	UNIT	STORES SYMBOL AND LOCATION	SPECIFICATIONS TO BE USED FOR						
TITLE AND DESCRIPTION OF MATERIAL									
REQUISITIONED BY _____		WRITTEN BY _____			APPROVED BY _____				
OR ORDERING QUANTITY	ORDERING POINT	STORES SYMBOLS AND LOCATION					DELIVERY PROMISED		
BIDDING	QUANTITY	LIBRARY PRICE	TRADE DISCOUNTS	NET PRICE	P.O.B. POINT	TERMS	DELIVERY PROMISED	REL.	
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NOTES - ALL QUOTATIONS MUST BE RECEIVED BY _____

QUOTATION RECORD POSTED BY _____ REASON _____	QUOTATION MUST BE RECEIVED BY _____ SHIP VIA _____ SHIP ON _____ SCHEDULE ADJUSTED BY _____ TO ARRIVE IN NEW YORK, N.Y. ON _____ PLACE ORDER WITH _____ ON _____ ORDER NO. _____ REASON _____ SIGNED _____ QUOTATION DIV. PURCH. DEPT.
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Form 57. Purchase Order Requisition. (Size 8½ x 11.)

The upper part of this form carbons with Form 10. It is similar to Form 17.

Orders Applying on Blanket Contracts

Requisitions for material which is already covered by a standing contract are also subject to checking for the purpose of reconciling them with the contract terms. The material record in these classes will still be useful, especially in those types of contracts which do not specify any one grade or size of the commodity but allow the buyer to order over a range of grades or sizes.

The Quantity

The quantity of an order is an important consideration. The proper quantity of a commodity not carried regularly in stock is determined by the size of the order in the completion of which it is to be used, as discussed in Part II. If the article is carried in the regular stores permanently, the quantity will be determined by the requirements of the business, the season of the year, the facility with which it can be obtained, and similar factors, as discussed in Chapter XI on "Control of Inventory." Thus the quantity desired to be purchased will be clearly indicated on the requisition.

While it is not incumbent on the purchasing agent to determine the quantity to be purchased, it is quite within his province to question the possibility of an error in what may appear to be an inadequate or an excessive amount, and to consult the originator of the order, if there seems an opportunity of saving money in the purchase price by increasing or decreasing the quantity called for by the requisition. For instance, a requisition may call for 450 pounds of paper when a 500-pound case would secure a 5% or 10% saving. Again, when deliveries are tightening and prices rising, an increase of the quantity may be expedient; or when the market is dropping, a decrease may be advisable, etc. In periods of retrenchment or of expansion, suggestions of this kind from the purchasing agent are particularly valuable.

Control of Requisitions

Requisitions vary in their importance and urgency. In a large concern only the most important need pass through the hands of the purchasing agent himself. Those covered by contract need never be reviewed by him, but may be written up at once, if the checking has shown them to be in proper order. The vigilant buyer will so closely supervise the work of his department as to prevent it from becoming too automatic, lest items which he should review be ordered without his knowledge. He will insist on seeing personally every order which is new or unusual, or which is over a certain limit in value.

Frequently it will be the chief clerk or assistant purchasing agent of the department who will review all requisitions, determining which ones should receive the attention of his chief. This method usually provides a sufficient control.

Similarly, the relative order in which requisitions are to be handled may be determined at the outset by someone whose knowledge and judgment will prevent the side-tracking of orders on which prompt delivery is doubtful or for which the need of the plant is urgent.

Fixing the Price

The last step of the essential procedure before the placing of the order is to fix the price. If the requisition calls for material which has already been contracted for at a definite price, all that is required is to insert the contract price, to indicate the time and point of delivery, and to note that the order is to be filled under the terms of the contract.

If the material is a new commodity or in a changing market, it may be necessary to request competitive bids of a number of reputable firms. This phase of the subject will be discussed in a subsequent chapter (XXIV).

CHAPTER XXII

THE MARKET

The Background

We have already indicated how essential it is that, the article which is required having been determined, the purchaser should know the market in which it is to be procured. Like all other factors of purchasing, the market presents a large background with which the purchasing agent must be perfectly familiar before he can expect to place his contracts to the best advantage.

This background consists for the most part of a mass of information and more or less scientific knowledge. Much of it is general and of a nature to defy tabulation, but most of it is concrete, specific, and immediate. Reduced to record form and incorporated in the files of the purchasing department, it becomes part of the stock-in-trade of the purchasing agent.

Knowledge of materials in general is even more important than the knowledge of the use to which they are to be put. Here is a line of research which the purchasing agent must pursue for himself alone. In this field he should make himself a specialist. He should not depend for his knowledge upon the department heads, and the extent of his specialized and exclusive knowledge of this subject and of market conditions may well be the measure of his value to his employer and his standing in his organization.

Knowing what he wants, the buyer must know what the market offers and how it is offered. He should know what he can get and where he can get it. Sometimes the sources of supply will be numerous and sometimes they will be few and

difficult to stimulate to prompt deliveries. The sources of supply are not to be determined or even located in a hurry. The data bearing on this phase of the purchasing agent's problem must be built up slowly and carefully.

In this chapter we are chiefly concerned with the general consideration of the market rather than the study of the individual vendors, which is treated in a subsequent chapter.

Forecasting the Market—General Information

The old proverb—coming events cast their shadows before them—is particularly true of economic conditions. The purchasing agent may have anticipated his needs with contracts for a certain commodity for a long period in advance and may feel safe. In such a case, unless something unusual should occur, he might not feel the need of consulting any statistics for that commodity for some time. Nevertheless the periodic study of all data enables him to forecast the situation for a still longer period in advance, in which case the time so spent will have paid him well.

The buyer must know the general condition of the market in which he is to make his purchases. He must be a close student of current prices and of the daily news that has a bearing on them. He must be able to anticipate any tendency towards an advance or a decline either in the general market or in the particular commodities that interest him. If he has the authority to originate blanket contracts on his own responsibility, he will find here a broad field for personal initiative. Here he has the opportunity to make a record for himself by applying his knowledge of market conditions with a view to making substantial savings by timely purchases. Even if he has no such authority, he should not neglect any opportunity to make suggestions bearing on the making or even cancellation of contracts, emphasizing thereby the economic importance of his office.

A knowledge of the general conditions prevailing in the market enables the purchasing agent to lay down a general policy which can govern all his transactions and provide a deciding factor in questions of detail. Spending half his time in reading financial and trade papers may be justifiable at times. Thus news of threatened transportation congestion, owing to lack of fuel and threatened strikes or embargoes, may suggest the purchase of supplies in anticipation of the season's needs and the stipulation of a delivery date somewhat in advance of the time requested by a purchase requisition as the date on which the goods will be needed.

To illustrate, a certain concern used a very large quantity of standard reamers, taps, and other small tools of one manufacturer whose product had been adopted as standard quality. It absolutely depended upon that one brand. The purchasing agent in his daily reading of the papers noticed that that manufacturer's city was threatened with a machinists' strike. Accordingly the market was gleaned and orders were rushed through to fill his requirements for several months. The tools were secured and in his storesrooms when the strike went into effect. While other manufacturers had to worry along without their favorite tools, he was supplied throughout the critical period.

In periods of general prosperity prices are high and unstable and conditions demand that only the most pressing orders should be placed to cover the period before prices begin to drop. Then comes a period of declining prices in which the purchasing agent may continue to buy lightly until his observations tell him that the bottom has been reached and the period of improvement has set in. Then he may inaugurate a general policy of purchasing for future requirements, contracting as far ahead as his resources will permit, but all the time watching the market narrowly for sudden changes and advantages that may demand a modification of his general policy.

It may be that this data bearing on market conditions will be compiled by a central statistical department under the supervision of some other executive. But even if none of this work is done in the purchasing department, these records must be constantly available to the purchasing agent. They should be referred to him as a matter of routine as rapidly as they are compiled rather than await the time when he calls for them. Business conditions are constantly changing. The purchasing agent may not recognize his immediate need for certain data until brought to his attention, but it is fairly certain that such material is of greater value to the purchasing agent than to anyone else in the organization.

Statistical Agencies

Many purchasing agents seek the aid of outside agencies in gathering the general information that will determine their broad policies. While no buyer can rely entirely on the opinions of others in regard to what the market is about to do, such agencies provide a means of comparing the opinions of others with his own. This gives the buyer confidence in himself if the opinions agree, or causes him to review again and perhaps change his opinions should they disagree about the general trend or about any commodity.

There are several good professional statistical agencies which at small cost furnish such information to their clients. Many banks and commercial houses furnish such information to their customers as a part of their regular service. They issue periodic reports concerning the market situation both in its general trend and in regard to its leading commodities, as illustrated by Form 58. Both phases are essential. The market situation in a single commodity may be entirely different from the general market conditions, though in general commodities somewhat follow the general trend of the entire market.

BABSON OPINION ON "COAL OUTLOOK"

A successful solution of the present labor controversy in the coal fields is not visible. Still the situation from a price standpoint is not serious. There is no scarcity of coal and there is no indication of any shortage for some time to come. The effect of the strike has established a rate of output even lower than the curtailed volume during the dispute in late 1919. Production last year of 407,000,000 tons, ruled materially under the previous ten-year average—fully 23%. Note production and price chart below (Form 62). Consumption, however, reflecting the period of depression and the status of industry, was fully 27,000,000 tons less last year than the restricted output. As a result, stocks on hand at the turn of the year were above the normal complement and during the first quarter of 1922 the available supply increased substantially. The present rate of output by non-union mines, together with total stocks, will adequately cover the potential demand for some months to come. Incidentally, fuel oil competition is bound to increase. . . .

BABSON COMMODITY OUTLOOK

(A small section of the Babson opinion on certain commodities is shown here.)

COCOANUT OIL—Supplies adequate. Yet, prices are conducive to moderate purchases for several months ahead.

COFFEE—Continue to take advantage of all substantial set-backs. Irregularity should continue.

COKE—Foundry—Clients by this time should have on hand adequate quantities for a month or so ahead. This also applies to furnace coke.

COPPER—Refined—Prospects favor higher rather than lower market. Accumulate stocks for future account.

Sheet—We consider sheet and wire a favorable buy for some months ahead.

LEATHER—Sole—Protect seasonal needs. Moreover, be prepared to buy more heavily if attractive purchasing levels materialize.

Upper—Purchase as with sole.

LEMONS—We still feel that seasonal purchases on weak spots will later react to advantage.

LIME—Cover adequately for 1922 needs, postponing extensive inventories.

LINSEED OIL—We approve of protecting seasonal needs. This is not the time, however, to get bullish. Seasonal reaction is due some months hence.

LUMBER—General—Relationship of supply and demand suggests higher price level.

Form 58. Extract from Report to Buyers (Babson)

While the reports of these agencies are of value, they should not be accepted uncritically. One agency may be an excellent authority or a very good guesser where copper is concerned and yet rarely anticipate correctly the changes in the grain market. The opinions of the various reports concerning specific commodities should be tabulated in a form similar to that illustrated in Form 59. After a few months, by comparing such a record with the actual trend of the market, data will be supplied for the criticism of the opinions of

SUMMARY OF STATISTICAL AGENCY REPORTS FOR			COMMODITY
MONTHLY REPORT	JONES AGENCY OPINION	NATIONAL BANK OPINION	MISCELLANEOUS OPINIONS
JANUARY			
FEBRUARY			
NOVEMBER			
DECEMBER			

Form 59. Summary of Statistical Agency Reports. (Size 11 x 8½.)

the different sources of such information without which they may conceivably be a handicap rather than a help. After a period of time it will be evident how much reliance can be placed on each opinion. Each will ordinarily be found to have its elements of strength and weakness. Probably none will be found entirely sufficient.

The buyer's knowledge of general business conditions cannot be restricted to his own commodities. He should know the trend of business in the principal commodities of every country and of each section. Depression in such commodities, even though he has no direct interest in them, will have an inevitable

effect on economic conditions in the country that produces them. On the success of the cotton crops in the South will depend largely the prosperity of that entire region, and by its prosperity, both buying and selling conditions are determined.

The most widely unrelated factors contribute important evidence as to the trend of business-export statistics, bank clearings, building permits, warehouse reports, railroad earnings, and similar data, must all be considered in determining the general condition of the market, and their cumulative evidence will usually determine important questions as to the time to buy and the extent of the purchase.

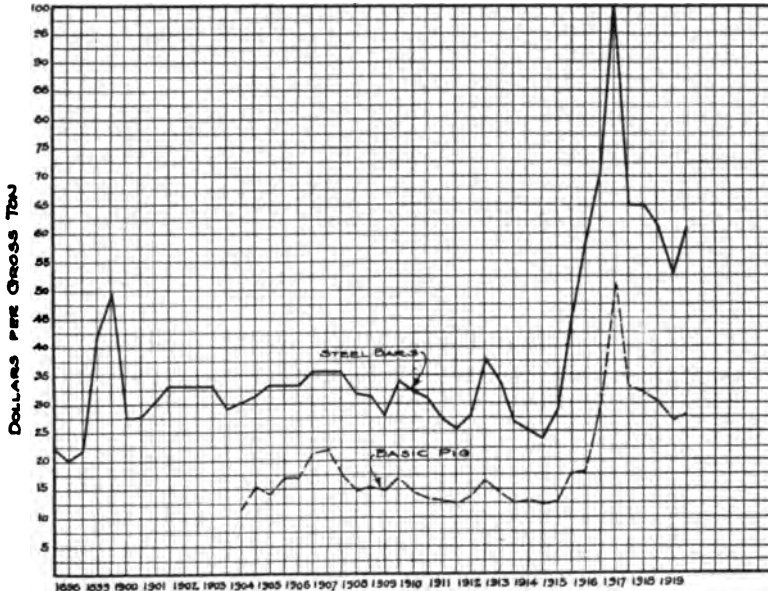
Graphic Presentation

General data of the kind that we have described are best presented by means of charts and diagrams. When we are sure that we have obtained the right figures, it is well worth the effort to present them in graphic form. Such presentations carry conviction where arguments and tabulated statistics fail. Here the data is predigested. It carries its message on its face and the detailed tabulation of figures becomes merely the evidence that the graph tells the truth.

Graphic presentation is peculiarly effective in showing a general tendency or a trend of events extending over a period of time. There are men who can glance down a column of figures and note the variations and the high points and low points with reasonable accuracy. But when it comes to a similar comparison of three or four columns simultaneously, only the highly trained few can accomplish the feat. Yet a graph can show precisely the same data in such a manner that everyone can grasp the essential facts almost without effort.

Graphic presentation is particularly useful in indicating the trend of prices. In Form 60 is shown the rise in the price of pig iron during a period of years and its effect on a

commodity of which pig iron is a component part. This is the simplest kind of chart and shows at a glance the entire relationship between all factors concerned.



Taken from *Iron Age*, January 1, 1920

Form 60. Graph Showing Price in Dollars per Gross Ton of Basic Pig, Valley, and Steel Bars, Pittsburgh

This illustrates how the price of a manufactured product follows the price of the basic raw material.

How to Make a Graph

Graphic charts are constructed on specially prepared paper. The paper is ruled by heavy lines into squares for convenience in drawing and then in reading the curve. The heavy vertical lines indicate the limits of the time intervals, while the heavy horizontal lines represent the prices. The chart is read from left to right and from bottom to top, the lower left-hand corner representing the starting point of the relationships to be shown.

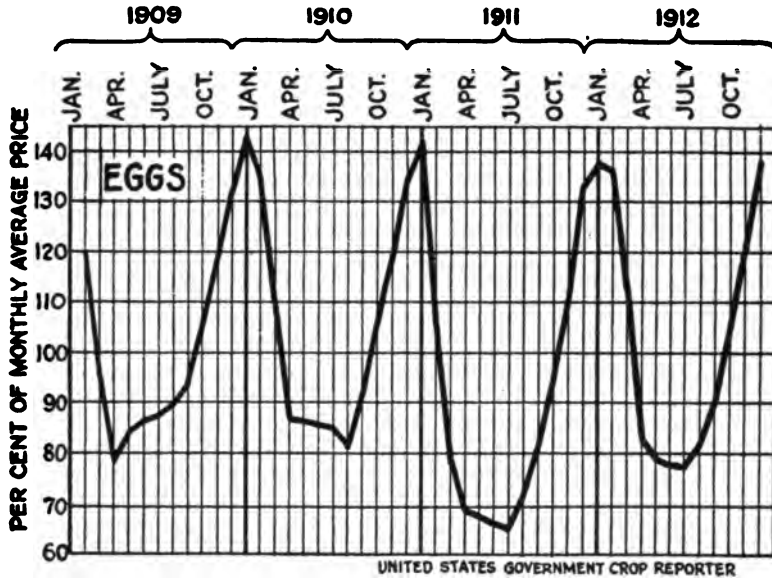
In this chart the left-hand border represents January 1, 1898, the next vertical heavily ruled line January 1, 1899 and so on. The distance above the bottom line represents the price, the base line representing \$0 and each heavily ruled horizontal line the limits of each \$10 per ton increase.

In the construction of any similar chart, the first step is to determine the unit value of each vertical and horizontal space which will best express the relationship desired. For instance, if a chart has 50 such spaces, each space must represent 20 if 1,000 is the maximum quantity to be expressed. The values are written along the sides of the chart at the proper intervals. They serve as scales for the locating and subsequent reading of the figures graphed. These figures are then laid off the proper distance to the right and upward. At the intersection of two imaginary perpendiculars erected on the base lines at these points, a dot is placed. This is continued so long as figures remain to be plotted. The dots are then joined by a curve and the chart is complete.

In Form 61 we have a graph taken from the United States Government Crop Reporter, which endeavors to give its readers such information relative to the price records of previous years as will enable them to sell at the time that prices are highest. Here we must read from the line representing 100%. The chart would be made much clearer were this line differentiated by being heavily ruled. A graph of this nature should have 0 as a base line. If space forbids this, two wavy lines near the base should indicate its remoteness from 0.

In the chart illustrated in Form 62 showing several relationships, the purpose is to show the changes in variations between them. This necessitates the use of a heavy line indicating the basal commodity, and of thin and dotted lines for the other relationships, or we may use several colors of ink. That this information is brought out much more pointedly in chart form than is possible by a long column of figures,

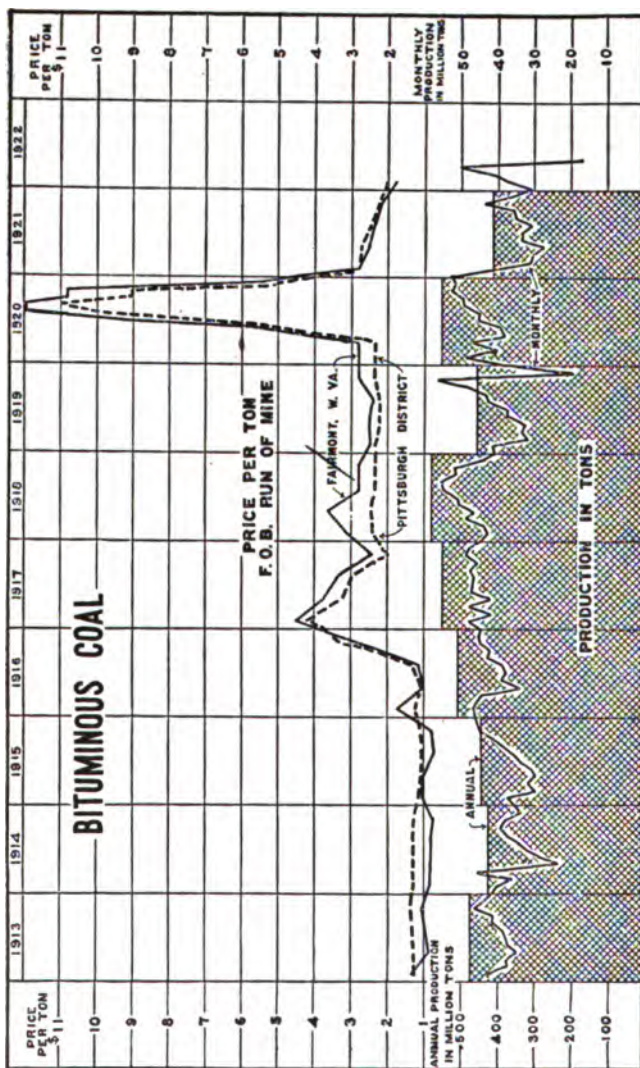
is apparent. Who would have the patience to follow the statistics for many years, tracing the many changes in price? Every peak and depression is suggestive, giving glimpses of



Form 61. Graph Showing Fluctuations in Price of Eggs in United States as Compared with Average of Monthly Figures for Four Years

fat and lean years reflecting the various developments and various influences and the constantly changing demand for the product.

In some charts we may wish to show several relationships on a single graph, such as the supply of a commodity on hand as expressed in quantity and in value, for the purpose of determining to which relationship is due the increased or decreased values, as is shown in Form 63. In such cases the *starting* points might be the same point but the unit value of the vertical spaces will be different and the three curves will diverge from the one starting point. In order to avoid con-

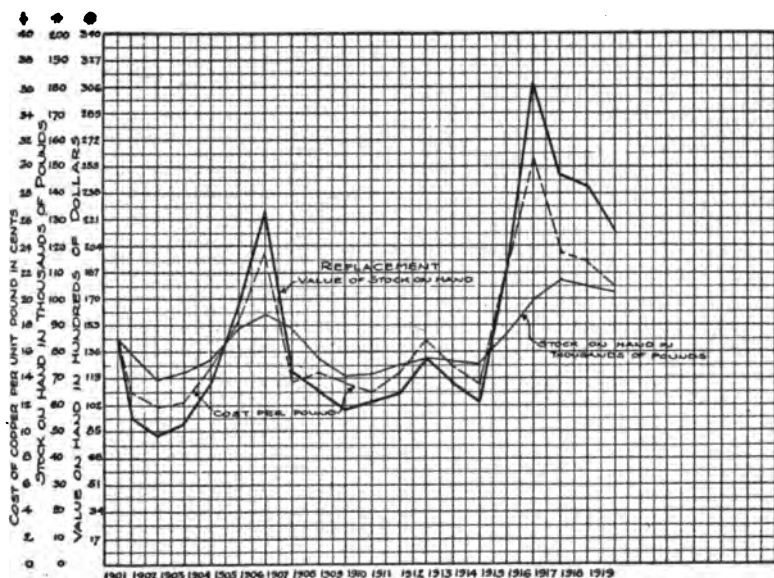


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Form 62. Price and Production Graph. (Babson.)
(By permission of publisher)

fusion we may note the second value beside the first in the same colored ink as we use in drawing the curve.

The purchasing agent who keeps a few charts over a period long enough to be of value for comparative purposes will develop an outlook on the future that will surprise himself. He will find himself able to forecast conditions and tendencies, often with uncanny accuracy. For instance, he will be able to determine that period of the year in certain trades in which producers drastically cut their prices to encourage sales in order to operate their plants at maximum capacity throughout the



Form 63. Graph Showing How the Value of Three Relations Diverge from a Common Point as the Relationships Change

It illustrates how in periods of high prices the value of an inventory skyrockets out of proportion to the increase in stock necessary to conduct a business over the period of prosperity, and how in the period of declining prices the replacement value can drop faster than the stock on hand. Hence the great necessity to watch inventories and contracts in order to conform with market conditions and finances.

year. In determining the details incident to the renewing of a contract that extends over any considerable period of time,

the only scientific procedure is to consult such charts as an indispensable preliminary to judging what is best to do.

The fact that the purchasing agent has made a contract covering a number of years does not mean that he is no longer obligated to keep a faithful record of prices. He must always be able to present evidence that the contract was a wise one, and the best evidence is a history of prices of the commodity since the contract was made. Even if such evidence proves the contract to have been unwise, the record will be useful not only in demonstrating to him the weakness of his judgment, but in helping him to avoid such a mistake in the future and possibly even pointing the way to the making of a supplementary contract which may overcome a part of this contractual loss.

Charts need not be restricted to recording prices. They may be equally effective in showing stock on hand, consumption, deliveries, and a mass of similar data. Some charts to be of value must be adjusted in detail every day, while others in periods of comparatively little activity need be plotted only once or twice each month. Then when the chart covering less active data shows a critical period, the intervals can be decreased to one day instead of one week or one month. This gives the maximum benefit with the minimum of clerical work.

Specific Information

Besides the general information discussed above, there is a mass of specific and immediate data that must be maintained and applied to each transaction. While all of this is directly applicable to the market, the compilation and maintenance of such data is discussed under those phases of the purchasing cycle in which it is even more applicable.

First of all, the buyer must know what the market offers, and to whom to turn for whatever he may want. He will know and have recorded all the essential data on every source

of supply which is a part of the logical market for the commodity in question. If he is foresighted he will also know as well to whom he may go in case of emergencies when strikes, embargoes, and similar influences have eliminated his logical market.

Under this head will also come the specific technical information discussed in the preceding chapter, and which qualifies the purchaser to gauge the market with intelligence and understanding. Perhaps his grasp of market conditions is best shown by his familiarity with the details which bear on supply and demand as reflected in the current price.

Supply and Demand

This factor, of course, has its bearing on the general as well as the specific problem. An analysis of supply and demand will give the data which determine the trend of the market and the prices of the future. A marked fluctuation in price should call for an investigation. Prices are only the surface indication and the buyer will look behind them and investigate until he can connect their movements with their causes. The buyer who has informed himself of the available quantities of a given commodity and of the current market conditions will have no difficulty in recognizing a manipulated price when he sees it. In such circumstances there is little he can do but to avail himself of his knowledge of substitutes or to cover himself for short periods and wait for the market to subside.

In a free and open competitive market, price changes furnish the key to the conditions governing supply and demand. For instance, in the copper market at a given time the demand sets the price; buyers come into the market and bid against each other for the available supply. If the supply is greater than the demand and there is little buying, the vendors may depress the price in order to bring more buyers into the market. A lowered price is likely to make it impossible for some

producers to continue to produce at a profit. They eventually drop out of the market, diminishing the supply by the amount of their production. When the total quantity wanted by the buyers is greater than the supply offered by the remaining producers, the buyers must raise their bids until more producers return to the field, increasing the available supply by the production of those who could not afford to produce at the previous price but who can produce and make a profit at the increased rate. This movement of adjustment goes on continually in every market open to free competition.

If the market is manipulated, however, and there is a combination or agreement between either the buyers or sellers seeking to hold up the price or hold down production, or to corner a commodity or create a monopoly, the market is no longer open and free and it becomes necessary for the buyers or the sellers carefully to guard against being caught without being covered in their requirements or in their supply.

The Personal Side

Surrounded as he is by his accumulation of facts covering every phase of his work, the material, the prices, and the vendors, the purchasing agent may feel himself independent of any of the strategic tactics that his predecessors felt to be their chief stock-in-trade. Such an attitude, however, may soon lead to a mechanical routine that is neither interesting nor intelligent. Even with tabulated competitive bids before him, there is still room for the display of considerable acumen, if he is to get the best that the market affords, not only in material and service but in price as well.

The purchasing agent still has a place for all his tact and skill and his knowledge of human nature in determining the most advantageous method of payment—lump sum, unit price, cost plus percentage or cost plus a fee, as described in Chapter XXIV. He may also exert himself in securing every

possible concession in discounts, service, and delivery and in making his business and his personal good-will something that the salesman will desire to cultivate and preserve. He will avoid a too rigid adherence to fixed methods and he will cultivate a diplomatic procedure and a winning personality. He will study his vendors until he knows them and their policies as well as they know themselves. Not until he knows his vendors as individuals as well as firms can he be said to know his market.

Correlation of Requirements and the Market

The buyer must continually endeavor to correlate the requirements of the factory with the condition of the market. He must know at any time the amount of the most important staple materials that the factory has on hand and how long that balance will last. He must know what quantities of that staple are on order, are contracted for, and in transit, and when they may be expected to arrive. To this end the materials control department should send him each week a report of the present status of all leading commodities, and his own clerks will complete the report by a record of orders unfilled and in transit. Such a report is shown in Form 64. In addition he should receive an estimate of the requirements for a considerable period in the future. This report is illustrated by Form 65.

With these two reports, the buyer has complete information before him and he knows when to hurry more material toward delivery, when to take advantage of a sudden market opportunity for making contracts, and what amount he can safely purchase.

Kinds of Prices

The buyer who knows his market, who knows current prices, market tendencies, and the character of the vendors

Form 64. Weekly Report of Materials Control Department. (Size $8\frac{1}{2} \times 5\frac{1}{2}$.)

Form 65. Estimate of Consumption and Balances. (Size 8½ x 11.)

with whom he deals, will know the nature of the prices that are quoted him. Here he should be recognized as a specialist, so that his authority and judgment will not be questioned. He will be the best qualified member of the organization to detect a manipulated price and to differentiate it from a competitive price. He will know when the price is excessive and when it is dangerously low and in either case whether or not it merits investigation before rejection.

Information on Vendors

The specific information dealing with particular markets in which the purchasing agent is actively interested will ultimately be contained in the files which he will maintain as a repository for his information on particular vendors, prices, and materials.

This information regarding vendors is of both a general and specific nature. In general he will desire to know both from whom he may secure certain materials and the business methods and practices of the various supply houses, their reliability, and the extent to which they are willing to co-operate with the buyer's efforts to secure materials. The vendor maintains a like record of the buyer and it is important that each should know the other as both are equally responsible for the contract.

Delivery Conditions; the Terms of Sale

The reliability of the house and similar data must all form a part of such information accumulated and confirmed through the study of facts obtained from many different sources, among which will be the following:

1. Catalogues and advertisements
2. Classified directories
3. Salesmen
4. Experience from trial orders

- The first files for such information would be the record of sources. Such information is sometimes recorded on a card similar to that shown in Form 66, in a form to be in-

[illegible]

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stantly available although it may be combined with other records. Here should be noted the seller's sources of supply if he is a jobber; if a manufacturer, the capacity of his plant, the amount of material which he carries in stock, the location of the supply, and the best transportation service between that point and the buyer's location. A record of the capacity of the plant will obviate the possibility of giving an order that cannot be filled within the specified time. The location of the plant may sometimes be a most important factor in saving time and transportation charges. Such information will enable the buyer to make no mistakes in going into the market either in emergency or in a case when he has plenty of time to get the material.

Information as to possible sources of supply is comparatively easy to secure when seeking materials even in a heretofore unknown field—from trade directories, for instance, from jobbers in related lines, and from trade papers. Salesmen are ample reservoirs of information relative to possible vendors.

In addition to this information, the purchaser should assure himself that there is or can be satisfactory competition and that the vendor is independent of any combination that may have been formed to control prices.

No vendor should be accepted as reliable until after he has been carefully investigated and determined to be a suitable party to deal with, financially responsible, and equipped to perform any obligations assumed. Generally speaking, the purchasing agent will have little difficulty in finding a suitable vendor; his problem is to select the best one. It is this phase of his work that forms the subject of the next chapter.

CHAPTER XXIII

SELLER AND BUYER

Interrelation of Seller and Buyer

The seller and the buyer are alike in business to make a profit. It goes without saying that neither can make his whole profit in a single transaction. From the point of view of both of them a permanent relation is desirable. Once a satisfactory connection is established, an increased return on a smaller expenditure may be expected. Mutual confidence, understanding, and respect may be regarded as lubricants of the wheels of business, simplifying relations, obviating inquiries and misunderstandings, and resulting in an exchange of favors and help. Under such conditions, service becomes an element not considered as due only when called for in the contract. It comes to be tendered gladly out of good-will and a desire to help. This will to serve extends often to the point where sellers are ready to inconvenience themselves and their organizations to meet an emergency need of a desirable customer. Thus, at the request of a purchasing agent the proprietor of a certain printing establishment was known to work personally and in addition to hold several employees for over forty-eight hours to fill a rush order of one of his customers.

In the previous chapter reference was made to some of the necessities resting upon the purchasing agent in quest of material. It was pointed out that close familiarity with the vendor's resources, with the quality of his previous service, and with his reputation, are essential to successful buying. In this chapter we will consider another essential—one having to do with the more intimate personal relations between buyer and

seller. This relationship, though less susceptible to standardized policy, is no less important in its possibilities for good or ill.

The doing of business in a spirit of co-operation, represented by the printer mentioned above, is the kind to be developed and fostered. That spirit does not ordinarily appear spontaneously. It is rather the result of conscious effort. It is the purpose of this chapter to indicate concretely the factors that must be present in business relations, if such good-will is to be assured.

In the first place it is well to remember that every purchase and sale agreement involves mutual obligations. The buyer agrees to give money and certain services in exchange for the material and service supplied by the seller. The contract price is not the complete cost of the material to the purchaser. In a broad sense, this cost is the price plus the value of the time and effort which the buyer must spend to secure the completion of the contract on the part of the seller. To reduce this additional expenditure by every means at his disposal is one of the duties of the purchasing agent.

On his part, the vendor delivers to the purchaser material which has cost him a certain sum of money. To this first cost he adds a certain amount to cover selling expenses; and finally, a profit is added, before the selling price can be determined. The less the expense he is obliged to incur in bringing about the completion of the contract on the part of the purchaser, the higher he will rate the purchaser and the more willing he will be to consider the possibility of a price reduction to him.

It is frequently true of small concerns, particularly proprietary firms or partnerships, that strenuous methods are necessary to secure payment. There are cases in which proprietary concerns have never made a payment over a very small amount except just prior to a formal legal action. Large concerns are not infrequently as great offenders in unnecessarily increasing

selling costs. Many of them habitually allow their due date to come and go without payment, on the theory that the vendor should be glad to receive their business regardless of when they pay their bills. While in such cases it is rarely necessary to take legal action, the strain on the vendor's good-will is as serious as it is unfair. Buyers whose firms are careless in the matter of payment have no just ground of complaint upon discovering that they have failed to secure the lowest price possible. But in the cases of those buyers who are punctual in meeting their obligations, this is one of the points at which the existence of mutually cordial relations may result in decided advantage to the purchaser.

Personal Contact with Vendors

As touching the relations between buyers and sellers, it is also well to remember that the purchasing department has two points of contact with vendors: through circular matter, and through the personal medium. The daily mail brings the vendor to the buyer's desk. His circular letters, catalogues, and selling propaganda, generally contain interesting possibilities. Aside from the general information as to the scope, policy, and character of the vendor's business of interest to the purchasing agent, they contain suggestions for the sales and advertising departments.

The vendor, on his part, judges the purchasing concern by every bit of pertinent information that comes into his possession. Such data as he obtains through the usual commercial channels is ultimately rounded out by the reports returned by his representatives, usually the salesmen, who come in personal touch with the purchaser.

Before the salesman pays his first call, he is usually provided with all the information available about the buyer and his firm. How detailed this information may be is shown in Form 67, which is used by a hardware jobber for every buyer

to be interviewed by his salesmen. This record gives the details of the information that help the salesmen to make an intelligent and effective first call and to avoid blunders.

Name: *Bryant, Frank V.*
Firm: *Chicago Machine Tool Co.*
Business: *Machine Tool Manufacturer*
Personal Address: *94 South 58th St.*
Family: *Wife, son 8, daughter 6*
Religion: *Prot.* Politics: *Republican*
Favorite sports: *Billiards; racing*
Likes to talk about: *Theater; Englishmen*
Special friends: *Cameron, P. A. for Union Railways*
Influential relations: *Brown, City Councilor*
Smokes: *Cigarettes*
Drinks: *None*
Customer's peculiarities: *Erratic, hard to approach*
Form 67. Vendor's Record of Buyer's Personality

In addition to this personal data is the general information relative to the firm's credit standing, general policies, reliability, business methods, and anything else that may have a bearing in determining the method of approach and the buying capacity and credit limits of the prospect. To this data with which he starts out, the salesman adds whatever of present or future value he is able to accumulate. A report similar to that indicated in Form 68 is made in duplicate, one copy of which the salesman forwards to the home office, the other being placed in his personal file. In the case of a proprietary concern, such investigations may extend even to the proprietor's family, their thrift or apparent disregard of expense—in fact to anything that may bear on his credit standing.

Attitude of the Purchasing Agent

In view of what has been said above, the attitude of the purchasing agent towards visiting salesmen is of obvious im-

REPORT ON CUSTOMER			
DATE _____			
FIRM NAME _____	PROPRIETORSHIP PARTNERSHIP CORPORATION _____	PRESENT COMMERCIAL RATING _____	
ADDRESS _____		TOWN _____ STATE _____	
PERSONAL CHARACTERISTICS OF MANAGERS OR PROPRIETORS: TO SALESMAN - USE A SEPARATE SHEET FOR EACH MAN REPORTED			
NAME OF MAN _____		POSITION _____	
AGE ABOUT _____	MARRIED SINGLE _____	ESTIMATED NET WORTH EXCLU- SIVE OF FIRM INTEREST _____	
INSURANCE _____			
OPINIONS OF TWO MERCANTILE HOUSES OR MEN IN DIFFERENT LINE OF BUSINESS AS FOLLOWS:			
CHARACTER _____		HABITS _____	
EVIDENCE OF OVERDUE HOME DEBTS _____			
FIRM DATA:			
LINE OF BUSINESS _____	AGE OF BUSINESS _____	ESTIMATED NET WORTH _____	INSUR- ANCE _____
STORE APPEARANCE _____	APPOINTMENTS AND SITUATION _____		OWN RENT _____
HOW OBLIGATIONS ARE MET LOCALLY _____		EVER FAILED _____	
ANY SUITS OR JUDGMENTS _____		WHEN _____	
PROMPT FAIR CONSIDERED SLOW PAY _____		GETTING AHEAD HOLDING OWN FALLING BEHIND _____	
REMARKS IN DETAIL			
CONDITION OF STOCK AS TO QUANTITY AND ASSORTMENT, BUSINESS POSSIBLE TO SECURE, ETC.			
REFERENCES OF AT LEAST FIVE HOUSES:			
SIGNED _____			

Form 68. Report on Customer. (Size $5\frac{1}{2} \times 8\frac{1}{2}$.)

portance. The wise purchasing agent will not assume to know it all. The salesman can usually tell him something new about his product. Though such information is not to be accepted uncritically, every salesman should be encouraged to tell what he knows. It is the easiest, most accessible, and sometimes the most practicable source of information open to the buyer. The greatest favor that the salesman can confer on the purchasing agent is to give him the benefit of such inside information as he may have relative to market conditions. It is usually the salesman who knows first of all when a commodity is to advance or decline, and when his factory is in a favorable condition for prompt delivery. There is no one to whom such information is so valuable as to the purchasing agent. Here the man who has kept the salesman at arm's length and has made no effort to obtain his good-will, is at a disadvantage. It is the frank, human purchaser who has made the salesman his friend, who gets from him the inside information that is best worth having.

When the salesman calls, welcome him, make him glad he came. If at all possible, have a reception room at the main entrance to the office. Have a rug on the floor and a comfortable chair for him to sit on. Do not let the office boy be the official welcoming agent of the company. An older man who appreciates the responsibility and who is friendly, is the ideal representative. A salesman likes to be remembered. Greet him by name, and above all do not keep him waiting. He is paid for what he accomplishes. Lost time is lost money for him—and for the purchaser as well. A salesman's salary or commission must be enough to live on, and in reckoning the basis of either, an allowance is made for a certain amount of lost or unproductive time, the cost of which is shifted to the buyer.

In the salesman's case are credit reports, other reports, and confidential data authorizing him to quote any prices and terms within certain limits. It is to his employer's present advan-

tage to get all he can for his product. The purchasing agent must influence the salesman to open to him those price and bargain lists if he is to get his supplies as cheaply and on terms as favorable as his competitors. If he is frank and above board, if he does not try to make the salesman believe he is in the market when he is not but that the time is being productively spent, he will be likely to win out. Furthermore the purchasing agent should see to it that orders sent direct are credited to the salesman. He should make clear the advantage of having him as a customer, that his business can be secured in fair competition, that his credit is good, and that no long waits in securing payment will be necessary. In short, the purchasing agent should cultivate the salesman in every honorable way, chiefly by square dealing.

If the purchasing agent shows the salesman that while his business may be small in the dollars-and-cents value of purchases made, it is awarded at less cost in selling expense to the vendor than is that of a larger customer, and that his business is steady, he has gone a long way toward establishing an effective working relation.

The Legal and the Personal Ties

The relations of the purchasing department with outsiders usually result either in contracts for the delivery of material or the laying of the foundation for the placing of such contracts in the future. Each contract will be bound by two ties: one legal, the other personal. It is the latter that makes purchasing pleasant and profitable. The purchasing department wants service from the supplier. Whatever service is secured over that required by the terms of the contract is determined by the extent to which the supplier considers it expedient to exert himself. He should ship only first-class goods, at the time wanted, and in first-class condition. The invoice, correct to the cent, and the shipping papers should be

forwarded promptly. All requests on the marking of packages and papers to conform with the buyer's system of handling purchases should be observed. These are all small matters in themselves but let ten single failures to comply with them occur in one day and the program of the purchasing department is seriously interrupted. Such failures to co-operate may well be remembered when future orders are in contemplation. The supplier may have kept entirely within his legal right, without apparent loss to himself, or he may not. However that may be, it is one of the duties of the purchasing department to make the personal tie such that there will be no occasion to consider the legal tie.

The ability of the purchasing department to bring about the close co-operation of the suppliers with which it has to deal is a most important element in determining its successful operation. Such help comes to the purchasing agent either because he is valued as a customer or as a personal favor. As an example of what may be done by buyers and sellers in co-operation, to ease a difficult situation, reference may be made to typical market conditions. Every market has two distinct and ever recurring phases—the "buyers' market" and the "sellers' market." The buyers' market is a time of falling prices when the seller is looking for buyers and not finding them. The sellers' market is a period of abnormal demand and rising prices, when the buyer must exert himself in order to secure the desired material at a reasonable price. The difficulties of both periods may be lessened and sometimes eliminated if the proper relationship exists between the purchaser and vendor.

In the buyers' market it may sometimes be worth the purchaser's while to oblige a vendor by placing his orders for material which he will ultimately need somewhat in advance. Whether or not such sacrifice is warranted depends upon the value of the vendor's good-will. Such good-will has proved

invaluable to many purchasing agents during the war period. They were in many instances almost wholly dependent on the willingness of the vendors to furnish the material which was well-nigh unobtainable in the open market. It is by his ability to induce the vendor to give service when the market is "tight," that the success of the purchasing agent is in part measured. The means available at such times are more often his powers of persuasion than any more strenuous methods. At such times the purchasing agent may well regret any brusque treatment of too zealous salesmen and feel the need of a spirit of co-operation that he has perhaps done little to further.

To a certain extent both buyer and seller choose the firms with which they deal. While a vendor will not ordinarily refuse to do business with anyone who will pay for what he receives, there is much that he wants to know about every firm with which he enters into a contract. He wants to know the reliability of his customers, their credit standing, their methods of payment, the amount of business it is possible to secure from them, and the extent to which they are willing to co-operate to the end that their part of the contract may be fulfilled promptly. The standing of the purchaser is always the subject of careful inquiry, on the result of which will depend largely the attitude of the vendor towards his customer.

Sources of Data

Data for the vendor is derived from many sources, the principal of which are:

1. The purchaser—voluntary statements furnished by the customer himself.
2. The salesman—personal reports conveying his general impressions of the character of the purchaser, his local reputation, and the state of his business.
3. Record of previous experiences as it appears on his books—perhaps the most important source and certainly the one on which the vendor places most reliance.

4. Credit leagues and trade associations—organizations for the mutual exchange of information.
5. Other firms selling to the same customer—usually a fair guide within the limit of the business done by each.
6. Professional credit reporting agencies. Dun, Bradstreet, etc.—of variable accuracy but usually reliable in their main outlines.
7. Bank references—these are usually of a general nature and are to be so considered.
8. Newspaper items and general rumors—meager, general, and of doubtful value until investigated but never to be overlooked.

The purchasing agent will realize that he, like the sales manager, is one window through which outsiders look upon his concern. He will make sure that his representation is worthy. What impression he makes will filter through various channels to the benefit or misfortune of every activity of his concern.

Credit Information Forms

Form 68 shows a typical form used in seeking information relative to the purchaser's standing by a jobber selling largely to the retail trade. It indicates the scope of such an inquiry and the factors that have a bearing on the ultimate standing of the purchaser in the vendor's credit department. On this standing the purchasing agent's ability to command prices and service will largely depend. If circumstances prevent a favorable report, the purchasing agent must accept the handicap and endeavor to overcome it as best he can by the force of his own personality and the personal relations which he is able to maintain with the vendor through his selling representatives. When the report is received from the salesman or other representative, the data are carefully reviewed and a judgment made regarding the desirability of nurturing the possible customer. For permanent purposes the data are recorded in a card file of appropriate form for future reference. This information,

together with the data showing how the purchaser performs his part of subsequent contracts, becomes the index to the buyer's character.

The buyer who resorts to questionable tactics need not expect to receive all that is to be desired. That man buys here today and there tomorrow, based upon his personal advantages and tricks. No permanent relation exists or can be—and the seller loses all the respect he ever had for this buyer who is a detriment to his profession.

Gratuities and Bribery

A buyer who accepts gratuities belongs to this class. Gratuities in the form of gifts are too often given to a buyer with the intention—perhaps unexpressed but nevertheless real—of influencing his decisions in favor of the vendor's offers. In fact the practice has reached such a stage that the Federal Trade Commission has asked Congress to enact a law as an aid to the preservation of fair and free competition and striking at bribery. Quoting from the communication to Congress:

These bribes take the form of commissions for alleged services, of money and gratuities and entertainments of various sorts, and of loans—all intended to influence such employees in the choice of materials. It is evident that this inexcusable added cost is finally passed on to the consumers.

Bribery is criminal per se. The Federal Trade Commission has no criminal jurisdiction. It treats the practice as an unfair method of competition. In dealing with commercial bribery, as an unfair method of competition, the Commission is entirely limited to dealing with one side, to wit, the giving side, and has no power to reach the receiver, who is also guilty.

The practice is one which has been condemned alike by business men, legislatures and courts, including among the business men, those who have finally resorted to it in self-defense in competing with less scrupulous rivals or in selling to concerns whose employees have extorted commissions under threats to destroy or disapprove goods submitted to them for test.

How prevalent the practice is now and how great the need of legislation seems to be illustrated by the statement of one man of prominence in an industry who welcomed the proceedings of the Commission destined to destroy the practice, with this statement: "From an experience of thirty years in the industry I don't believe that there is a single house in it that has not had to pay bribes to hold old business or to obtain new business. Bribery is inherently dishonest and tends to dishonesty and is unfair to competitors and customers, and I don't believe it ever will be stopped until made a crime by the United States Government."

Corrupt employes having the power to spoil and disapprove materials have been able to bid one salesman against another until in many cases they have extorted secret commission, so-called, as large as 20 per cent of the value of the goods sold.

The Commission feels that the stamping out of the commercial bribery is one necessary step to the preservation of free, open and fair competition, and to that end respectfully urges that such legislation should prohibit not only the giving and offering, but the acceptance and solicitation of any gift or other consideration by an employe as an inducement or reward for doing any act in relation to his employer's affairs or business, or for showing, or forbearing to show favor or disfavor to any person in relation to his principals' or employers' affairs or business.

In order to prevent a resort to a common method of corruption it is recommended that the law should also prohibit the giving of any such gifts or other considerations to members of the agent's or employe's family, or to any other person for his use or benefit, direct or indirect.

It is useless to discuss the origin of the practice. It is sufficient to know that it exists generally and appears to be spreading. The mere suggestion shows that it must engulf even those honestly inclined if they desire to maintain their commercial life in any industry where such practices prevail.

Acceptance of Favors and Courtesy

From this report it is apparent that the purchasing agent must be fortified to resist the very suggestion of unfair dealing.

The pressure upon him to sell his control over the purchasing function for a price may be insistent and powerful. Every man must be largely his own judge as to how far he can safely go in his personal relations with salesmen who are seeking his goodwill and his orders. The man who would refuse a cigar or an invitation to luncheon might well be considered as leaning backwards and exhibiting a narrow-mindedness that borders on discourtesy. At the same time, whenever a sense of obligation begins to restrict this freedom of judgment, the purchaser may well draw back even at the risk of appearing eccentric.

The wise purchasing agent will extend every courtesy to every salesman with whom he comes in contact. He will meet friendship with friendship and he will know how to win a respect and esteem that will prevent the possibility of his being considered as a subject for any proposal that he cannot entertain with honor.

Vendor Expects Correct Purchase Orders

The vendor also has a right to expect that every purchase order which he receives shall contain exact information covering all points relative to the material which the buyer desires to purchase. All the information relative to quality, quantity, and delivery should be determined and clearly defined at the outset, to the end that further inquiries may be avoided. Continued inquiries to obtain facts which the purchaser should have supplied at the outset cost both time and money and make it more difficult for the seller to complete his part of the contract. Sometimes it is even necessary for the seller to send a representative to clear up an essential point. These unnecessary expenditures decrease the possibility of the purchaser obtaining a more favorable price on his future orders, depreciate the value of his firm as a customer, and strain severely the friendly relations between the two organizations.

The Purchaser's Requirements

As the business-giving party to the purchase contract, the purchaser's requirements of the vendor are even more numerous and he is in excellent tactical position to enforce them. They may be briefly summarized as follows:

THE LOWEST PRICE. This is an important object of all purchasing agents. Having determined on the right article and arranged satisfactory conditions of purchase, the buyer wants to feel that he has been quoted the lowest figure at which the vendor supplies his product under such conditions. As we have just pointed out, the purchaser's inability to obtain it may be due to several reasons. It may be the purchaser's indifference to his obligations to give service, coupled perhaps with a demand for unreasonable service from the vendor. Perhaps the purchaser's attitude has so increased the selling cost as to make it necessary for the vendor to protect himself by a higher price. He may have taken an unfair advantage of the standing and strength of his firm, with the result that he has so lessened its desirability as a customer as to place himself at an unnecessary disadvantage. Or the vendor may be quoting a high price with the intention of forcing the purchaser to accept another's bid. This is one way of tactfully losing a purchaser's business, without antagonizing him—a consummation sometimes devoutly to be wished.

RELIABILITY. The purchaser has a right to demand that the vendor keep his promises. A firm may have the highest credit rating and yet be chronically unreliable. The constant failure to make performances equal promises will offset financial standing, excellent workmanship, and advantageous prices. Fortunately, the purchasing agent's information on the vendor's accomplishments will provide a safeguard against a blind repetition of an unfortunate experience with an unreliable vendor.

HONEST STATEMENTS. Closely allied with the above is

the purchaser's demand that the vendor confine himself to accurate statements as to the quality of his materials, what they will do, and when delivery can be made. Extravagant statements as to quality are less frequent since the universal adoption of qualitative tests. Irresponsible statements by salesmen as to the capacity of their plants and the date on which they can effect delivery are more frequent. The purchasing agent is justified in holding the vendor to such promises and in refusing to do further business with him if he fails to make good.

It is conceivable that the purchasing agent may be indirectly responsible for promises that cannot be kept. The salesman, overzealous to conclude his sale, should not be tempted and even forced, as he sometimes is, to promise the impossible. On the other hand he is entitled to the truth. He should be given to understand at the outset that the buyer will insist on the terms of the contract. He should know that the delivery date is bona fide and will be insisted upon, and that on the contracted delivery date he cannot request and confidently expect an extension of time.

Service Record

The buyer should maintain a record of the character of service that the vendor usually gives, and something of his reputation and financial standing. The buyer is entitled to safeguard himself against having his order delayed by the vendor's financial inability to carry on his operations and against the never-ending inconvenience and demoralization incident to doing business with a firm that habitually promises more than it can perform. Whether promise has equaled performance in a given case can be made a matter of record by the use of Form 69, which is self-explanatory.

Many purchasing departments do not feel the need for this information, particularly if they defer payment for ma-

accordance with the preliminary understanding and with a spirit of fairness and mutual co-operation of all the varied details incident to a sales transaction, generates a feeling of confidence and good-will which becomes to both vendor and purchaser a business asset of incalculable value. It may be the deciding factor in future transactions, reducing the service cost to both parties and leading to their more successful conclusion. Without the spirit of a square deal there cannot be a complete understanding between buyer and seller; disputes will arise; and the purchaser will always find it hard to obtain the price and the service to which he feels he is entitled.

CHAPTER XXIV

THE PRICE

X Preparing to Issue a Purchase Order

The purchase order should contain the terms on which the buyer does business with the vendor. In its preparation every care should be taken to insure accuracy. Chapter XXI describes how the purchase order requisition (Form 57, page 287) originated, as described in Part II, and how it is carefully reviewed upon receipt in the purchasing department to see that it specifies exactly what is required, that the quantity wanted and the date on which the material is required are clearly indicated, and that all other details conform to regulations. Then if all the requirements have been met and the requisition is in perfect order the purchasing procedure may be set in motion.

The second task is to compare the requisition with the contract record file. Is there a blanket contract covering the material requested? If so and if it is a quantitative contract, what is the balance purchasable and is it sufficient to meet the present demand? The make-up of the contract record is shown in Form 70. If a contract exists, the purchase order applying on the contract may be written and forwarded at once as all details are already arranged. If no contract exists the routine procedure of arranging the price and the details of an individual order must be set in motion.

Quotation File

To this end the requisition is next matched with the quotation and past purchase order file, as illustrated in Form 71.

[illegible]

the purchasing agent determines where to purchase the required article, and from the trend of the quotations about what price he may be obliged to pay. If quotations on file are of recent date and satisfactory, the purchase order may be written at once. If not, bids should be solicited from reliable sources. If the sources as shown here seem insufficient, reference may be made to the record of sources of material (Form 66, page 309). In this connection, a further reference to the vendor's reliability file (Form 69, page 326) may be expedient, in order to review the record of the service rendered by the prospective vendor in previous transactions. If these files fail to furnish several sources of satisfactory supply, it will be necessary to search for other vendors, and to solicit bids from those of

good standing who are equipped to handle the order. Such bids are conveniently requested in the form letter illustrated in Form 72.

→ Request for Bids

The request for bids is made out in the purchasing department in duplicate, both copies being sent to the vendor. The request should indicate clearly and in detail the delivery date, the quantity and unit of material desired, and the conditions which the purchasing department expects to include in the purchase contract. Whether such conditions will be looked upon as so much red tape which the vendor can disregard at his pleasure, or a part of the contractual obligation to which he will be held and from which it will be dangerous for him to depart, depends upon the future policy and attitude of the purchasing agent. The request is keyed with the same number as the purchase requisition for purpose of cross-reference. After note has been made on the requisition of each vendor solicited, the record is filed until the tenders arrive.

Tabulation of Bids

When the vendors have filled out and returned to the purchaser the second copy of the "request for bids" with its accompanying conditions, all preliminaries to the drawing up of the contract may be considered as concluded. As rapidly as received, the vendor's price, terms, shipping point, etc., are recorded on the table provided for this purpose on the purchase order requisition shown in Form 57 (page 287). It is assumed that every vendor who has been asked to quote prices is a reputable dealer with whom it is safe to contract because he is able to fill the order or has sufficient financial resources to execute it. If, however, this is not the case, and the name of a doubtful vendor appears upon that tabulation, a note to that effect should be written in the proper space on the requisition form.

THE BUYING COMPANY NEW YORK, N.Y. PURCHASING DEPARTMENT THIS IS NOT AN ORDER				REQUEST FOR QUOTATION NO. _____ _____ 102		
TO _____ Please quote us your lowest price for shipment to arrive New York, N.Y. by _____ for articles described below, using the attached duplicate for your reply. Your reply should be in our office by _____						
SPEC. NO.	QUANTITY AND KIND REQUIRED	UNIT AND DESCRIPTION	LIST PRICE PER UNIT	TRADE DIS- COUNTS	NET PRICE PER UNIT	BID TO BE MADE FROM SPEC. OF ORDER
TO RECEIVE CONSIDERATION, YOUR BID MUST STATE WHEN DELIVERY CAN BE MADE.						
Shipping Point _____ Suggested Route _____			F.O.B. New York, N.Y. * Subject to terms _____			
<p>If you are unable to furnish same in accordance with our specifications, quantities, etc., or wish to offer substitutes, please give full details, sending samples of substitutes, if possible.</p> <p>A purchase order accepting your quotation will be covered by the following conditions:</p> <ol style="list-style-type: none"> 1. All packages must be marked with our purchase order number and contain an itemized list of contents. 2. Invoices and shipping receipts must bear the order number and must be mailed on the day of shipment. 3. Each shipment must be covered by a separate invoice. Articles on one order must not be billed with those on other orders. 4. The right is reserved to cancel any order if not filled within the contract time. 5. The conditions of order shall not be modified by any verbal understanding or agreement. 6. Charges for boxing and carting will not be allowed unless previously arranged. 7. The acceptance of our order includes all terms, prices, delivery, specifications and conditions stated therein. 						
THE BUYING COMPANY Please reply on and return copy 2 of this form as soon as possible.						

Form 72 (a). Purchasing Agent's Request for Quotation (copy 1).
 (Size 8½ x 11.)

Form 72 (b). Purchasing Agent's Request for Quotation (copy 2).

The Price

With the bids before him the purchasing agent is ready to consider the price. The purchase contract is to be the agreement entered into by the purchaser and the vendor, under which the vendor agrees to furnish a certain amount of material for a certain consideration. This consideration must cover the sum of two values—the cost and profit values of the material to the vendor plus the cost of other factors known as service.

✱ The good buyer is always trying to decrease the cost of his purchases. He has no control over the production cost of the material but he can reduce the margin which the vendor reserves for service and his profit. It is first necessary, however, for him to consider the various factors that enter into the determination of the price. As previously stated, the selection of the right article is the first consideration of the purchasing agent, and relatively price is always to be considered of secondary importance. Only when two offers are received from firms of equal responsibility which give the same service and submit identical articles, does price become the determining factor.

The service offered in the bids should be considered as part of the value to be received, and, as stated before, the purchaser must consider the possibilities and consequences of transportation or other difficulties, and in the case of the unreliable bidder, the possibilities and consequences of poor service are increased.

✱ Competitive Prices

The advantage of obtaining bids from two or more sellers before placing any order for a considerable quantity of material has been previously indicated. Whatever may be the purchaser's knowledge of prices in the market at large, he should at least take advantage of such opportunities as competition between vendors offers him. It is, however, only a

waste of time to solicit or consider bids from vendors either unable or unwilling to supply goods of the quality desired or to finance and complete the order on time if they receive it. The custom of obtaining low bids from such vendors for the purpose of forcing down the bids of desirable vendors cannot be justified on any grounds. The reputable purchasing agent will not ordinarily depart from the logical market in seeking his sources of supply and from that market he will eliminate all except those whom he is sure are able to carry out the provisions of a satisfactory transaction.

There are various discounts to be taken advantage of. Many producers maintain a sliding scale of prices theoretically based on the size of orders, but practically constituting a margin which can be yielded according to the exigencies of the situation. Large buyers and many small ones, whose trade is desired, are granted a rebating discount based upon the amount of competitive business received during a period. A stationery and printing firm grants a 15% rebate on the total business received during the month. A hardware concern offers a discount on a sliding scale based on the business of a year. The buyer is of course justified in getting as much of a rebate as he can. Most manufacturers usually sell to jobbers at a lower price than to the ultimate consumer, but an exception to this rule is occasionally made by giving certain buyers the benefit of the resale price.

Price Maintenance

In a sense there is no such thing as a standard price even for articles whose price is said to be fixed. One supplier may agree to deliver f.o.b. destination while another quotes f.o.b. shipping point only. Discounts are offered for prompt payment and rebates are offered on total business. Yet producers have long attempted to maintain a standard resale price for trade-marked articles whose reputation and good-will have

been developed by great effort, often by the expenditure of large sums for advertising. It has been claimed that the same article without its familiar label has occasionally been sold at a lower price than is demanded for the product under its trade-name. In buying an advertised article there is a certain protection for the purchaser, notwithstanding a possible higher price, one advantage being that the producer does not as a rule demur to the return of damaged or defective goods. On the other hand, the prices of highly advertised articles must bear the burden of their exploitation and usually a higher percentage of profit. The producer of such a commodity, especially if it is patented, is in a position to maintain his price. He may refuse to sell in bulk and he usually is reluctant to make price concessions. Price maintenance constitutes an increasingly important factor in the marketing of advertised goods to which the purchasing agent must give due consideration.

It is an open question as to whether or not the benefits of purchasing a trade-marked article of known reliability offsets price considerations. The decision must be based on the claims for the merits of the substitute offered for the advertised article and the purchaser's facilities for technical inspection and test of those claims.

✚ Kinds of Price

If price is a very important consideration, every purchase contract should explicitly state it. Probably more disputes and hard feelings between buyers and sellers arise because of disputes about this important matter than from all other causes. This must be guarded against.

There are four bases on which prices may be fixed, as follows:

1. A definite price based on a lot or unit.
2. Price based on performance.

3. Current price at time of delivery with or without definite limits.
4. Price composed of the cost plus a percentage or amount as profit.

The Definite Price

The contract which contains a stated and definite price is the most usual and the most satisfactory because it is the simplest in form. It leaves no room for misunderstanding, each party knowing exactly what he will receive or give under the contract. It is necessary, however, to distinguish clearly between two kinds of stated prices; one for a stated lot of material, the other for a particular unit. A price consisting of a lump sum for a given lot deprives the purchaser of his right of selection; he must pay the entire amount even if he accepts only part of the lot, while if the price be a unit price, the purchaser pays only for such units as he accepts after inspecting the material. Usually a lump sum is specified for a quantity of specific material and for material which cannot be sold on a unit price basis, as for example, when the exact quantity is not known.

Price Based on Performance

Certain materials are sometimes bought and paid for on the basis of their performance in actual use. Fuel and oil are well-known commodities frequently purchased on this basis. For instance, coal that generates a stipulated number of British thermal units or calories of heat per ton may be paid for at a certain rate, the price being scaled proportionately if it fails to meet these tests. Automobile tires with their guaranteed adjustments for mileage are another example. There is no good reason why this method cannot be applied to all commodities, the merits of which cannot be easily judged in any other way.

Current Prices

In the purchase of staple commodities with a fairly settled and known market it is customary to contract for them on the basis of the current price at the time of the delivery. Such an arrangement is advantageous to both buyer and seller, as it guarantees the delivery and sale of certain material, allowing both parties to make plans for the future with assurance. In the case of materials the price of which can be easily determined by the market quotations, this plan is very popular. A common method is to use the average daily price quotations for the month as the basis of payment for all material delivered during that month. Such arrangements may be extended over a long time, the parties to the contract sometimes protecting themselves by fixing the limits above and below which the price shall not go. Thus in the purchase of cotton a maximum and minimum limit of 20 and 16 cents may be fixed. Both buyer and seller assume some risk, but both enjoy the benefit of knowing the future price on which they can finance their businesses during the period covered. Under this plan, the possibility and the effect of loss due to price fluctuations still exist but the entire loss possible does not fall on one party, being divided between them. A knowledge of the general market conditions and the extent of fluctuations which may be expected during the specified period will determine the wisdom of accepting a current price with or without maximum limits.

The Cost-Plus Contract

Occasionally in an unsettled market, or under unknown conditions of manufacture in which the seller is reluctant to carry the full risk of a contract of an unusual nature, an arrangement is entered into, known as a "cost-plus" or "agency" contract. Under this contract the seller agrees to do a certain piece of special work for the buyer in return for the

reimbursement of the actual cost plus a certain per cent thereof or a certain amount as his commission or profit for doing the work.

Under this plan many variations are possible. A clause may be inserted in the contract setting the maximum cost and the latest delivery date. If market conditions keep the actual cost below the stipulated maximum, the seller may receive a part of the difference between the actual and the estimated costs. If, on the other hand, cost exceeds the maximum, the profit to the seller may be cut. The possible variations in the price stipulations of such a contract are unlimited. Many of the large contracts placed by the government during the war for ships, cantonments, arms, clothing, and munitions, were "cost plus 10%" as profit to the supplier. Contracts for small items such as tools, patterns, and experimental work are frequently made on the basis of a certain rate per hour for all work on the contract.

The cost-plus type of contract is obviously an accelerating measure, demanding that the buyer assume most of the risks, but it results in a saving of time at the expense of dollars. At times the condition of the labor and material market may make this the only method of getting work done. Yet the plan may conceivably defeat its own object. The more waste of time and materials in doing the work, the more it costs and the larger the amount represented by the profit. Such a contract is subject to easy manipulation and must be carefully audited. It is at best a dangerous arrangement and should be avoided whenever possible.

List and Net Prices

Quoted prices are either list or net. List prices are subject to trade discounts and the remainder is the net price. Net prices are subject to cash discounts or to special terms of payments. List prices and trade discounts exist for the conven-

ience of the seller. By adjusting his discounts he can avoid making changes in the prices printed in his catalogue each time market prices fluctuate, or he can conceal the variable net prices he quotes to different buyers by differences in the trade discount offered to them. Thus the list or catalogue price remains the same and only the discount is varied. Large buyers usually receive a larger discount than smaller buyers.

As a rule trade discounts are built up by classes, all buyers in each class receiving a certain trade discount. Thus there may be a group of class B buyers who receive a small discount, a class C receiving a larger discount, and so on to the extent that the classification is established by the seller. Whenever a seller decides to change his price after he has issued a catalogue, it is only necessary for him to send out a price list, using the number or symbol of the particular article or class to designate the new discount on that particular class of goods. For instance, a certain line of hardware may carry a discount of 25% but due to a rising cost of production the vendor may cut the class A discount from 25% to 15%. In such a case it is only necessary for him to advise the trade of the change of discount by forwarding a notice to this effect.

A purchasing agent should try to discover such cases of varying discounts. They are generally used in quoting catalogued articles. When a seller quotes but one discount, as above, a varying discount is much harder to recognize than when a series of discounts are offered, as 40% and 10%. This series generally indicates that the seller quotes varying discounts to different customers.

Transportation Charges

There has been considerable discussion as to whether a transportation charge is a part of a material's cost or a general item of expense. The former opinion is to be preferred. To see how this works out the discussion of price maintenance

shows how a supplier selling trade-marked material at a certain fixed price is at liberty to vary the price by allowing the buyer the freight charges from shipping point to destination, where as his competitor does not offer that inducement.

F.o.b. Destination

In arranging for the delivery of material, the purchasing agent should, whenever possible, stipulate that it be made f.o.b. destination, first, to decrease the cost of the material; secondly, that the vendor may be responsible for all negotiations with the transportation company, including any claim for damage in transit or for overcharge; and thirdly, that formal delivery will not be made until the day the material is received at destination, thus allowing ample opportunity for inspection before payment is due. If impossible to secure quotations f.o.b. destination, the buyer should always endeavor to have the material shipped freight prepaid, thereby relieving himself of the clerical details in connection with the charges and adjusting any matters with the carrier. It has been held that the party who pays the transportation charge is responsible for the recovery from the transportation company of any claim for overcharge or damage; therefore, if freight is prepaid, all responsibility rests with the seller.

As a rule the purchasing agent experiences little difficulty in obtaining an f.o.b. destination shipment and few concerns refuse their customers this accommodation. The "request for quotation" illustrated in Form 72 shows the f.o.b. delivery point to be New York which is the location of the buyer. In one instance this method of having the delivery point printed on the request for quotations resulted in over 90% of the bids received being on the basis of f.o.b. destination, practically without any increases in the prices asked f.o.b. shipping point and practically without any increases above the transportation cost.

Discounts for Prompt Payments

The method of payment is an important feature of a price and one which often permits the careful purchasing agent to save his concern considerable money. As a general rule it is possible to secure a reduction of the net price in the form of a discount for cash within a certain length of time from the delivery time. In this he must co-operate with the finance department, for it is sometimes possible to juggle trade and net discounts quoted to suit the finances of the business. Contrary to general belief and practice, the credit period allowed for payments begins upon the day of delivery, wherever and whenever that may be. If material is quoted f.o.b. shipping point, 30 days net, the bill is due 30 days from the day of shipment; if quoted f.o.b. destination, the bill is due 30 days from arrival. Purchasing agents are more and more demanding that sellers observe this rule before requesting payment.

Cash discounts have been the subject of attack from many quarters and movements have been introduced for their elimination. Though there is much difference of opinion as to the value of their use, it is often contended that it would be best for all parties concerned if they were abolished. Then the price quoted would be the net price, and the price of an article with a supposedly fixed value would be more truly fixed. To effect the abolition of cash discounts, however, would require the standardizing of the time of payment for all buyers and all orders would have to be either cash payable on delivery or within 30 days or on some agreed basis.

In practically every line of trade there is an established custom relative to the time and terms of payment. However, these accepted terms are varied according to the wish of the vendor and are subject to negotiation between buyer and seller. For instance, a buyer making a contract covering a long period of time which totals a considerable amount, may reasonably request a substantial discount for cash on delivery

and lesser discounts on time payments—the discount varying with the credit period. In such cases he may obtain either a 5% discount for cash, or 2% for 10 days, or 1% for 30 days.

The saving made by taking advantage of the cash discount varies with the rate of the discount and the period of time during which it runs. In some instances it may be more profitable to disregard it. Assume, for instance, two transactions offering 1% discount for payment in 10 days from delivery, but one at 30 days net and the other at 90 days net. Assume also that the ruling price of money is 6%. It would pay a buyer to accept the discount on the 30-day net period but not that of the 90-day period. Accepting a discount on the first he would be gaining 18% per annum on the money involved, against only $4\frac{1}{2}\%$ on the second. The second should be paid at the end of the 90 days even though the firm's custom is to discount all bills.

Whether discounts are taken or not usually depends on the financial condition of the business. Every large contract should be made with an understanding of the probable supply of ready cash at the time the purchase is to be paid. If the immediate resources of a concern are low, the purchasing agent tries to secure longer credit period in return for waiving the discount. If the bill remains unpaid at the end of the net credit period, and the seller draws on the buyer for the amount of the bill, the draft should be promptly met. On the other hand, a vendor may be willing to increase the cash discount if the net period is shortened. If his concern has plenty of ready cash, the purchasing agent, as a matter of policy, asks for discount concessions and expects them.

Trade Acceptances

An old method of payment, but little used up to recent years, is the trade acceptance which in the last few years has been coming into more general use in the American market. A

trade acceptance may be defined as a bill of exchange drawn upon the buyer by the seller and accepted by the buyer upon the delivery of the goods. It is similar in tenor to a draft but differs from it in that a draft is not usually drawn until after

TRADE ACCEPTANCE	Accepted	192	No.		192	\$	
	To	Payable at	(Designate bank or place of payment)	This Sixty Nine days after	{ date sight	pay to the order of OURSELVES	Dollars.
			(Signature of Acceptor)	The obligation of the acceptor hereof arises out of the purchase of goods from the drawer.			

TRADE ACCEPTANCE	Accepted	192	No.		192	\$	
	To	Payable at	(Designate bank or place of payment)	after	pay to the order of	Dollars.	
			(Signature of Acceptor)	The obligation of the acceptor hereof arises out of the purchase of goods from the drawer.			

Form 73. Trade Acceptance Forms
Prepared by Federal Reserve Bank of Cleveland, Ohio

the transaction has been carried out and usually after the credit period has passed; a draft, furthermore, may be given in return for other considerations than in payment for goods. The trade acceptance, as illustrated in Form 73, is usually filled in and sent by the vendor with the invoice. The purchaser is expected to sign it (technically known as accepting it), and

return it to the vendor as soon as the delivery has been approved. The acceptance constitutes an agreement on the part of the buyer to make payment on a stated date for the material. He gives up the option under his former method of a time period for deciding whether to take a discount for prompt payment or a net payment at the end of the credit period. In case he fails to pay the acceptance on the date on which due, as the document is sent through his bank for collection, it becomes a tangible record before the commercial world that he has failed to meet an acknowledged obligation. Under the old method, if he failed to pay his account on the due date, such failure would ordinarily constitute nothing more than a private issue between himself and the seller. His credit rating in the general commercial world would not thereby suffer greatly.

The advantages derived by the buyer from the use of the trade acceptance are thus described in a bulletin issued by the Irving National Bank of New York City:

- (a) It develops careful buying.
- (b) It enables him to keep better track of his outstanding obligations, thereby avoiding the evils of overextension.
- (c) It strengthens his credit and puts him in the position of a preferred buyer.
- (d) It develops in him the habit of prompt payment and furnishes him with an excellent excuse for requiring prompt payment from his customers.
- (e) It enables him to realize that credit is as tangible as cash and should be guarded and used accordingly.
- (f) It eliminates wastage and lost motion attending the open book account method.
- (g) It is good business because it releases business capital for new transactions.
- (h) It improves the chances of the buyer of small means to operate in successful competition with the large buyer.
- (i) It helps the buyer by making him deal always in current transactions rather than in long-drawn-out book accounts.

- (j) As the buyer often becomes a seller, the same advantages that apply to the seller apply to him.
- (k) It serves as a tonic to the business organizations concerned.
- (l) It prevents the accumulation of overdue accounts.
- (m) It develops a sounder and more serious attitude toward the buyer's own obligations.

The advantages to the seller of goods are thus enumerated :

- (a) It relieves him from the burden of financing his customers and the consequent burdening of his own capital.
- (b) It enables him to conduct business on a more systematic basis, with a more regular income schedule.
- (c) It puts the burden of providing correctness of the details of the merchandise transaction where it belongs—upon the buyer.

Until trade acceptances come into more general use in American business, sellers must continue to offer special inducements and discounts to encourage buyers to use this method of payment. A signed trade acceptance is in effect a note payable, by which an account payable is turned into a negotiable instrument and a more easily proven and collectible liability.

CHAPTER XXV

THE WRITTEN CONTRACT

Kinds of Contracts

The purchase contract agreement should always be in writing if the almost inevitable misunderstandings and dissatisfaction are to be avoided that are the inevitable results of a verbal arrangement. Verbal agreements and orders are too easily forgotten to be risked. The legal phases of contracts are discussed in Chapter XXVIII.

There are two generally recognized forms of purchase contracts:

1. A special, single purchase order contract covering a particular purchase usually for a small quantity and originating from a purchase requisition.
2. A blanket contract which covers a large quantity usually of raw materials or supplies with the delivery date indefinite.

Single-order contracts are generally left to the discretion of the purchasing agent, his decision as to price, vendor, and so on being final and based on his independent judgment. A blanket contract is invariably placed only after a most careful survey of all the data available has resulted in its approval by the management. In either form of contract, however, the same principles operate in the matter of price and the same needs must be kept in mind.

Blanket Contracts

Every purchasing agent has ample opportunity to show his good business judgment in developing blanket contracts, for

the success of many businesses depends upon the wisdom with which such contracts are made. Although in some lines of business and types of manufacture blanket contracts cover from 50% to 90% of the total purchase requirements, very few businesses have exhausted the possibilities for saving through these contracts which practically always bring many advantages in price and delivery impossible to obtain by using the casual inquiry for price and delivery as the particular need for a material arises. In placing such contracts the state of the market must be carefully gauged and studied by the purchasing agent acting as the expert appraiser of raw material values. The terms of blanket contracts practically always are very definite as to price but seldom include more definite stipulations regarding shipments and delivery dates than a clause to the effect that "shipments are to be approximately so many units per month," or that "the total contracted quantity is to be taken within so many months or years," or some similar statement of quantity and deliveries. Frequently they cover a variety of materials instead of one. Their possibilities are so varied that the purchasing agent's cleverness will be tested in arranging stipulations exactly in accordance with his needs and in seeing that the wording of the contract clearly defines what he intends.

The Individual Purchase Order

After a blanket contract has been placed, the directions regarding deliveries are usually given by means of individual purchase orders (Form 74). The terms and conditions are those previously determined, with directions to ship a certain quantity and the stipulation of a definite delivery date. This form is also used for placing a single contract following the receipt of a purchase requisition and the securing of bids. These orders are alike except that the first class will refer to the blanket contract to which it applies.

Every purchase order should include the following :

1. Name of the vendor to whom the order is given.
2. The description of the goods desired.
3. The quantity and units of goods wanted.
4. The price to be paid, including terms, etc.
5. When delivery is to be made.
6. Shipping directions.
7. Any special identification marks for packages, such as the purchase order number.
8. Any special conditions or references not written out in detail in the order.
9. The signature of the purchaser.

The matters enumerated above have been discussed in detail in the preceding chapters with the exception of one important consideration—the time of delivery.

Fixing the Date of Delivery

The importance of a definite delivery date, especially in the purchase of materials required for manufacturing, cannot be overestimated, and the careful purchasing agent will specify in his order the date wanted. The purchase requisition from which his negotiations originate, should state—and he must insist that it does state—a definite date when the material is required. Any requisition which lacks that information should be returned for completion. The setting of the delivery date is of great importance. A too early delivery means needless expense; a delayed delivery may mean disaster. Raw material in storage, while waiting to be used, represents so much increased burden for the idle time before actual work upon it begins and it may be subject to deterioration. The buyer will, therefore, approximate as closely as he dares to the latest possible date for delivery but he will always err on the side of safety, and regardless of other considerations he will see that delivery is on time.

Difficulty of Effecting Prompt Delivery

If the mere placing of the purchase order insured the receipt of the article desired, buying would be so simplified as to become almost automatic. With every precaution, however, delays are likely to arise, many of them beyond the buyer's control. It is his task to reduce such contingencies to the minimum by taking certain routine precautions.

The purchasing agent who buys only on a price basis may lose all the advantages of price economy and greatly increase the final purchase figure by placing his order with unreliable concerns. He soon learns that concerns which offer the most attractive prices are, as a general rule, unable to offer equally attractive service. Though the most reliable supplier may fail occasionally to deliver on the date promised, such failure is accidental; whereas poor delivery service is frequent with the supplier whose quotations have been accepted on the basis of price alone.

As previously stated, a supplier's record as to delivery service should be noted on the vendor's reliability record (Form 69, page 326) for future reference in estimating the relative value of the service to be expected.

Advance Information of Factory Requirements

As the efficiency of the purchasing department depends largely upon fulfilling the needs of the factory, it should keep in close touch with the production departments' requirements. It is not its province to question the accuracy of the date on which the material is required as stated in the purchase order requisition, and this date must be accepted in good faith. Though it is assumed that the purchasing department will be reasonably efficient, that it will place the order without delay and that it will expedite delivery, the requisitioner should make a reasonable allowance for the purchase routine and for possible accidents and delays, and he should not expect the perform-

ance of the impossible. It is sometimes not the least difficult of the purchasing agent's tasks to obtain such co-operation, but obtain it he must.

It is incumbent on the buyer to keep the department heads posted on all changes that affect deliveries of the major materials they use. It is their part to anticipate their needs and to give him a tentative estimate of their most important requirements before filing their requisitions. Haste in purchasing is disastrous to all parties concerned. Only by close co-operation can it be avoided. The far-seeing purchasing agent, however, gauges the situation in advance. If he is uninformed he takes measures to inform himself. In the last analysis, when delays occur, however legitimate may be his excuses, he will be called upon to bear more than his share of the blame.

When the purchasing agent has obtained an authentic date on which the materials are required, this date appears on the purchase order itself and the vendor should be closely held to his bargain to meet it. If the consuming departments are habitually honest and careful in estimating their future requirements, if the time allowed for delivery has been reasonably determined, and if the vendor has discovered from his past experiences with the purchasing department that its demands are sincere and will be insisted upon, delivery on time is reasonably certain. Conversely, laxity or insincerity in time stipulations inevitably means delays.

Allowance for Time in Transit

If the vendor is to deliver the goods ready for use at a point other than destination, the time required to complete shipment must be taken into consideration, and in setting the delivery date, allowance must be made for the period the goods are in transit.

The purchase order illustrated in Form 74 states that the vendor is to "ship to arrive New York on....." This

statement throws on the vendor the responsibility of shipping early enough to allow for transportation difficulties or delays that can be foreseen. The arrival date may be and sometimes preferably is stated, not as a single date, but as a period defined as "to arrive between.....and....." The vendor has the privilege of shipping at any time he chooses so long as the material arrives within the stated limits.

The law states that if payment is to be made on delivery, the delivery should be made before sunset in order to give the buyer a chance to examine the goods. If an article contracted for is lost or destroyed in transit, it is considered—unless otherwise provided for—that delivery occurred with its dispatch and the loss is the buyer's. The parties are considered to have realized that such a thing may happen and are supposed to act accordingly. On the dispatch of the goods the contract is legally discharged.

Time for Completion

If no time for performance is stated, every contract is supposed to be performed within a reasonable time. The exact delivery time should be stated in the contract, otherwise it will be considered as of no effect if a long period goes by without anything being done by either party. Many contracts have a clause providing that the contract must be completed before a certain date. Should this date pass before completion, the contract invalidates itself. When a performance becomes impossible by what is known as an "act of God," such as a tornado, a hurricane, a flood, a conflagration, or some other unforeseeable accident, the contract is considered as discharged. War discharges all unperformed contracts between citizens of enemy countries. If any of the terms of the contract have already been fulfilled by either party, the contract will merely be suspended until the war is over, when it must be carried out in accordance with its terms.

A contract may provide for its own discharge on the happening of a certain event. It is common to insert provision against strikes and similar happenings, but such clauses must be in the body of the contract if it is to hold. A notice at the top of the firm letterhead that all sales are subject to strikes or accidents, would not form part of a contract, written on the letterhead.

The Copies of the Purchase Order

[Having selected an article, provided for its delivery, determined the price, and arranged satisfactory terms of payment, the formal purchase order (Form 74) is sent to the vendor for his acceptance.]

As many as six copies of this order may be made out to serve different purposes and functions distinguished by their colors, as follows:

No.	COLOR	DESTINATION
1	White	To vendor—the contract proper.
2	Pink	For purchasing department serial file.
3	Gray	To receiving division for identifying shipments.
4	Yellow	To accounting division, thence to auditor.
5	Brown	To originator of request for the material.
6	White (cardboard)	To purchasing department follow-up file.

[As a rule the purchase forms are numbered serially in advance, to prevent their loss and for purposes of identification. The body and outline of all copies are alike—various changes and additions being made to permit the copies to serve different purposes.] A small concern does not need so many copies, requiring only copies numbered 1, 3, 5, and 6. The data to be typed on the order are all taken from the requisition, the handling of which has been described previously. The purposes

ORIGINATOR OF REQUEST FOR MATERIAL	THE BUYING COMPANY (COPY 1)		
	TO	NEW YORK, N.Y.	192
REGISTRATION NO.	PLEASE FURNISH US WITH THE FOLLOWING MATERIAL IN ACCORDANCE WITH YOUR QUOTATION OF		
STORES SYMBOL AND LOCATION	QUANTITY	UNIT AND DESCRIPTION OF MATERIAL WANTED	LIST PRICE AND TRADE DISCOUNTS
		Return Acceptance Card Promptly, giving Complete Shipping Information.	
TERMS SHIP VIA		F.O.B.	TO ARRIVE NEW YORK, N.Y., ON
<ol style="list-style-type: none"> 1. All packages must be marked with the order number given above. 2. Invoices and shipping receipts must bear this order number. Mail them on day of shipment. 3. Each shipment must be covered by a separate invoice. Articles on this order must not be billed with those on other orders. 4. The right is reserved to cancel this order if not filled within the contract time. 5. The conditions stated in this order shall not be modified by any verbal understanding or agreement. 6. Charges for boxing and carting will not be allowed unless previously arranged. 7. If price is not stated on this order, the material must not be billed at a higher price than last paid without notifying us in advance. 8. The acceptance of this order includes all terms, prices, delivery, specifications, and conditions stated herein. <p style="text-align: right;">THE BUYING COMPANY</p> <p style="text-align: right;">_____ PURCHASING AGENT</p>			

Form 74 (a). Purchase Order (copy 1). (Size 8½ x 11.)
(See page 357 for description of copies)

ORIGINATOR OF REQUEST FOR MATERIAL	to	<div style="text-align: right;">(COPY 2)</div> <div style="text-align: center;">PURCHASE ORDER COPY FOR PURCHASING DEPT'S MASTER SERIAL FILE</div> <div style="text-align: center; font-size: 1.2em;">№ 35353</div>				
<div style="display: flex; justify-content: space-between;"> TERMS F.O.B. </div> <div style="display: flex; justify-content: space-between;"> SHIP VIA TO ARRIVE NEW YORK, N.Y., ON </div>						
ORIGINATOR OF REQUEST FOR MATERIAL	TO	<div style="text-align: right;">(COPY 3)</div> <div style="text-align: center;">PURCHASE ORDER COPY FOR RECEIVING DIVISION</div> <div style="text-align: center; font-size: 1.2em;">№ 35353</div>				
<div style="display: flex; justify-content: space-between;"> TERMS F.O.B. </div> <div style="display: flex; justify-content: space-between;"> SHIP VIA TO ARRIVE NEW YORK, N.Y., ON </div>						
DATE RECEIVED	DESCRIPTION OF ARTICLES	CHECKED BY	QUANTITY RECEIVED	QUANTITY ACCEPTED	BALANCE DUE	FILE REPORT SERIAL NO.
ORIGINATOR OF REQUEST FOR MATERIAL	TO	<div style="text-align: right;">(COPY 4)</div> <div style="text-align: center;">PURCHASE ORDER COPY FOR ACCOUNTING DEPT. AND AUDITING DEPT.</div> <div style="text-align: center; font-size: 1.2em;">№ 35353</div>				
<div style="display: flex; justify-content: space-between;"> TERMS F.O.B. </div> <div style="display: flex; justify-content: space-between;"> SHIP VIA TO ARRIVE NEW YORK, N.Y., ON </div>						

Form 74 (b). Purchase Order (copies 2 to 4)
In copy 3, column "List Price and Trade Discounts" is eliminated.

[illegible]

Form 74 (c) Purchase Order (copy 5)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	M

PURCHASING DEPARTMENT'S (COPY 6)
 FOLLOW-UP FILE
Nº 35353

TERMS				F.O.B.			
SHIP VIA				TO ARRIVE NEW YORK, N.Y., ON			

ITEM				ITEM					
Acknowledged	Promised	Notice of Shipments Invoice Bill of Lading	Rec'd	Invoice Number	Acknowledged	Promised	Notice of Shipments Invoice Bill of Lading	Rec'd	Invoice Number
Urged	Promised	Part of Complete	Order	Invoice Amount	Urged	Promised	Part of Complete	Order	Invoice Amount
Urged	Promised	Date Mat'l Rec'd	Copy of Material Received Sheet	Urged	Promised	Date Mat'l Rec'd	Copy of Material Received Sheet	Urged	Promised
Urged	Promised	Mat'l Accepted	Balance Due On Order	Urged	Promised	Mat'l Accepted	Balance Due On Order	Urged	Promised

Form 74 (d). Purchase Order (copy 6)

Copy 6 is on card stock. Reverse side of this copy is a continuation of the items shown below on this form; also at top of reverse side numbers are given in reverse order, reading from right to left.

served by the various copies of the purchase order are as follows:

Copy 1—the original—is perforated along the left margin in order that the requisitioner's name and any other data not pertinent information for the supplier may be entered on the margin and separated from the order proper before it is mailed. The order must include all conditions governing the performance of the order. Conditions of delivery, packing, and shipment which are imperative may be printed, for emphasis' sake, in red ink. The other conditions on which the purchaser may insist if occasion arises, and to which the vendor subscribes as well as to the typewritten terms, prices, delivery rules, and specifications, appear in black ink. The original, when signed by the purchasing agent or his authorized representative and when checked for completeness and accuracy, is sent to the vendor together with the acceptance card shown in Form 76.

Copies 2 and 4 contain the same data as the original, except that the conditions involved in the transaction do not appear. On copy 3, the column showing the price and trade discount is obliterated in order that such confidential data may not be divulged to the receiving department which is not concerned with it. At the foot of copy 3 appear columns in which the receipt of the material may be indicated. At the foot of copy 5 provision is made for the notation of any balance due. On copy 6, placed in the follow-up file, provision is made for recording the receipt of material on partial shipments, to the end that the follow-up clerk may know the status of any given order at any time.

Inspection of Purchase Order

[As an error or omission may alter the character of the entire contract and result in a disastrous transaction, before the purchase order leaves the purchasing department it should receive a rigid inspection with a view to determining that it is

correct in every essential. No purchase order may be considered as complete until it carries the correct date, the exact name and address of the vendor, the proper quantity of material required, the definition and specification which coincide with that standardization by the firm, the time and place of delivery, the price—either a lump sum price or a price per unit—the time of payment, and the method of payment. If a printed specification of the materials be attached to the purchase order, only a definite reference to it will make it a part of the contract. Since the purchase order is the authorization to disburse money, the importance of each of these items is self-evident.

Should any changes be made in the original order, such as its cancellation or the revision of its terms, a form (Form 75) similar to the original purchase order is made out and the various copies are sent to the parties concerned with the change. The vendor's copy is accompanied by a new acceptance card. When other departments are advised regarding a change in an order and no copy need be sent to the vendor, the original copy should be destroyed.]

Vendor's Acceptance of the Order

[An acceptance card, illustrated in Form 76, should be sent to the vendor with each purchase order, the return of which is an acknowledgment of its receipt and a definite acceptance of the contract. As will be explained in detail in Chapter XXVIII, "Some Legal Aspects of Purchasing," any minor deviation from the terms of the contract in the purchase order will invalidate all previous arrangements and no contract can be formed by merely placing an order. The acceptance card binds the vendor to the bargain and completes the contract.

Another function of this card is to supply the purchaser with the shipping data which he will require in his follow-up work. It is not always expedient or possible to allow the buyer to specify the shipping route. While the buyer is probably

Form 75. Supplementary Purchase Order. (Size 8½ x 11.)

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more familiar with traffic conditions and possibilities near the point of destination the shipper may know them better at the point of shipment. Furthermore, the shipper has the privilege of routing the article to the delivery point as he pleases, so

DATE _____
THE BUYING COMPANY, NEW YORK, N.Y.
THIS ACKNOWLEDGES RECEIPT OF YOUR
PURCHASE ORDER NO. _____ DATED _____ FOR
_____ WHICH WE ACCEPT. SHIPMENT WILL
BE MADE ON _____ VIA _____
PER _____

Form 76. Vendor's Acceptance of Order

(Private post-card forms, self-addressed to Purchasing Department)

long as he meets the delivery time. Again, since information was last available to the buyer, conditions may have changed, making it desirable to use a different routing. Hence the routing data on the purchase order can be only considered as suggestive.

The purchase order is designed to include thorough routing directions, but this routine is only suggestive and the vendor may modify it to meet current traffic conditions. As a matter of business policy, however, the vendor may be expected to follow it if it is at all possible, not only for the sake of meeting his customer's wishes, but because he realizes that the buyer is usually in an equally good position to choose the best routing.]

CHAPTER XXVI

EFFECTING THE DELIVERY

Vendor Naturally Remiss

The purchasing agent has the right to assume that prompt shipment and the effort to keep a promise of delivery are part of the vendor's service for which he has contracted. Nevertheless, he must realize that the performance of vendors, like that of other mortals, does not always live up to their promises. Therefore, he must combat their tendency to lethargy by constant reminders that he is expecting the goods by a certain date. This tendency is most aggravating when a seller's market prevails and a sales department accepts orders in excess of the factory's capacity to supply the goods—a policy encouraged by the knowledge that the buyer is unlikely to do better elsewhere. The purchaser is then justified in ruthlessly following up the vendor until his contract is fulfilled. Whatever the cause of delay, he has the right to insist on delivery and he should spare no effort to impress the seller with the importance of prompt service and the disastrous effects of failure to deliver.

To adhere to a delivery date once fixed is very important. An investigation of 50 orders placed with one supplier showed that 80% were scheduled for delivery far in advance of requirements. Hence when the vendor failed to ship them on scheduled time, the lax follow-up man was not asked about the delay and he in turn failed to jog the vendor. The investigation showed that not one delivery was made on time and in most cases deliveries lagged, until at length the need for the materials became imperative. It was discovered that

not until the scheduled date for delivery had passed did the vendor begin his preparation for the manufacture of some of the articles to be supplied. This incident illustrates what not infrequently happens when the purchasing department fails habitually to insist on delivery by the promised date whether the goods are needed or not.

Follow-Up Work

To hold the vendor to his promises is one of the most important duties of the purchasing department. The clerk to whom is assigned the task of following him up must be tactful as well as persistent. Necessary as the work is, it involves the possibility of so antagonizing the vendor as to make him indifferent to the service he gives. It is reasonable to assume that the seller is just as interested in securing and holding customers as is the purchasing department in obtaining the goods ordered. It is easy for the follow-up clerk to effect his purpose by means of form letters devised and standardized to cover practically all orders. The use of such forms obviates the personal note that may cause irritation, thereby producing an effect opposite to the one desired.

When and how frequently this routine follow-up work should be undertaken is a matter to be determined by circumstances. Ordinarily the majority of orders placed are for stock material ready for shipment almost immediately upon receipt of an order. For such purchase orders a follow-up is practically unnecessary, unless the time for delivery is short, the matter important, or the vendor unreliable. Orders for special material are in a class by themselves and need more individual attention. Anything from a week to several months may be required for their production and accordingly they need a systematic follow-up.

The follow-up work is clearly indicated by the forms employed. Form 77 is a return postcard on which the supplier

	OUR PURCHASE _____ ORDER NO. _____ YOUR ORDER NO. _____ ACKNOWLEDGED _____ DELIVERY PROMISED _____
THE ABOVE PURCHASE ORDER CALLS FOR _____	
 PLEASE ADVISE US AT ONCE ON REPLY PORTION OF THIS CARD, AS TO WHETHER DELIVERY WILL BE MADE AS PROMISED; IF NOT, WHY NOT AND ON WHAT DATE WILL YOU DELIVER? _____	
DATE _____	THE BUYING COMPANY PURCHASING DIVISION
<div style="display: flex; justify-content: space-between; align-items: center;"><div style="text-align: center;">POST CARD</div><div style="border: 1px solid black; padding: 5px; text-align: center; width: 150px;">Place 1-cent stamp here</div></div> <div style="text-align: center; margin-top: 20px;">THE BUYING COMPANY, NEW YORK, N.Y.</div> <div style="text-align: center; margin-top: 20px;">PURCHASING DEPARTMENT SCHEDULING DIVISION</div>	

Form 77 (a). Post-Card for Routine Follow-Up of Delivery
(Private post-card together with return card—Form 77 (b).)

<u>REPLY ON AND RETURN THIS PART OF CARD</u>	
TO THE BUYING COMPANY,	
NEW YORK, N.Y. _____	
YOUR PURCHASE ORDER NO. _____	
CALLING FOR _____	WILL BE
SHIPPED ABOUT _____	FOR DELIVERY ON _____
_____ SHIPPER	
DATE _____	PER _____
POST CARD	
<div style="border: 1px solid black; padding: 5px; text-align: center;">Place 1-cent stamp here</div>	

Form 77 (b). Post-Card for Routine Follow-Up of Delivery (continued)

confirms the delivery date promised on his acceptance of the order. Such a confirmation is suitable for use on orders requiring from two to six weeks for delivery. As a rule this card should be sent a week or so prior to the expected date of shipment. Form 78 is used when the goods fail to arrive on scheduled time. It is in duplicate and the vendor is requested to return copy 2 with his report of the shipment.

Appeal to Sales Agent

Sad to say, not all suppliers promptly explain the reason for the failure to keep their promise with suitable explanations for the delay. All too frequently, no notice is taken of the request, in which case the purchaser may well drop the use of forms and resort to a personal letter or investigation.

A sales department is ordinarily as jealous of any reputation gained for service as for quality. It is often only necessary for a purchasing agent personally to call such matters to the attention of the sales manager of the supplying house to make certain that the delay will be investigated and the shipment accelerated. If the matter is of extreme urgency the buyer should not hesitate to approach the man higher up in the selling organization. If the business of the purchaser is desirable, a branch manager or some other responsible authority will very frequently arrive by next train to explain matters and remove any unjustifiable cause for irritation. These conferences are often helpful in straightening out questions in dispute and in arranging for a more satisfactory service and sometimes for better prices in the future.

As an anticipative means of insuring delivery, the purchase order (Form 74, page 354) states that the buyer reserves the right to cancel the order if the delivery is not made as specified. Every order should make clear that delivery on time is essential so that the manufacturing schedules may be carried out. In important contracts, the buyer sometimes reserves the right to

THE BUYING COMPANY		RUSH
New York, N.Y.		ORDER TRACER
PURCHASING DEPARTMENT		
TO		192
PLEASE REFER TO OUR PURCHASE ORDER NO.		DATED
YOUR ORDER NO.	, WHICH YOU ACKNOWLEDGED ON	PROMISING
DELIVERY ON	FOR THE FOLLOWING MATERIAL.	
 THESE GOODS HAVE NOT BEEN RECEIVED. WILL YOU KINDLY LOOK INTO THE MATTER AND ADVISE US AT ONCE ON THE ACCOMPANYING BLANK AS TO THE STATUS OF OUR ORDER AND WHEN WE CAN EXPECT DELIVERY? IF ANY OF THE ABOVE HAS BEEN SHIPPED, PLEASE GIVE FULL INFORMATION AS TO SHIPMENT.		
 THE BUYING COMPANY SCHEDULING DIVISION		
 PLEASE REPLY ON AND RETURN COPY 2 OF THIS FORM AS SOON AS POSSIBLE..		
 COPY 1		

Form 78 (a). Request to Vendor to Trace Shipment (copy 1). (Size 8½ x 11.)

TO PURCHASING DEPARTMENT
THE BUYING COMPANY
NEW YORK, N.Y.

RUSH
ORDER
TRACER

192

FROM

IN REGARD TO YOUR PURCHASE ORDER NO. DATED
OUR ORDER NO. , WHICH WE ACKNOWLEDGED ON
PROMISING DELIVERY ON FOR THE FOLLOWING MATERIAL.

WE REPORT THE ABOVE ☐ HAS BEEN ☐ WILL BE SHIPPED AS FOLLOWS:
DATE OF SHIPMENT SHIPPING POINT
CAR INITIALS AND NUMBER VIA
EXPRESS
REMARKS

SHIPPER
PER

DATE 192

PLEASE REPLY ON AND FORWARD THIS COPY TO THE BUYING COMPANY AS
SOON AS POSSIBLE.

COPY 2

Form 78 (b). Request to Vendor to Trace Shipment (copy 2)

buy the article in the open market, charging any difference in cost to the vendor. The vendor is thus told at the outset that he will be held responsible for damages resulting from delay. If he accepts the order under these conditions he is likely to do everything possible to insure prompt delivery.

Progress Reports

When considerable time is required to manufacture the goods, the follow-up work may take several forms. If, for example, a special machine tool or other equipment is on order, the supplier is asked at regular intervals for a written statement of the progress made to date. A progress report need not be written. Often it is more satisfactory for an agent of the buyer to visit the manufacturer and find out the exact status of the order. The report of the agent will more accurately describe the quantity and quality of work done than any report compiled by the supplier.

Rush Orders

While it is always advisable to allow ample time for manufacture and shipping, there will always be some orders which suppliers must be asked to handle out of sequence and with haste. The customary method is to mark or stamp them "rush" or "emergency," in ink of a striking color and in type of a large size; or a sticker printed on a bright-colored paper is attached to the order. These orders must be followed up in some special way, the method depending on their number. The attention given by the supplier to the rush order depends upon its rarity. The danger of asking too frequently for the privileges of emergency must be watched lest they be abused.

"Ship and Trace"

The purchaser sometimes affixes to his rush order the words "ship and trace," which is in effect a request to start a tracer

on the day the goods are delivered to the transportation company. Such a practice justifies in a measure the refusal of some railroads to trace goods that have not had time to reach their destination and it minimizes the effect of legitimate requests. The railroads waste time and money in investigating shipments that have neither gone astray nor been unduly delayed. The best means to insure prompt delivery is to choose the proper method of transportation and to start the shipment in ample time.

Mechanism of Follow-Up Work

There are various means of bringing the order to be followed up to the attention of the clerk responsible for the work. Under the plan suggested here, which has been used successfully under varied conditions, the last copy of the purchase order is sent to the follow-up clerk. This copy is a heavy card, across the top of which are the dates of the month. Metal signal flags are slipped over the dates on which the order is to be brought to the clerk's attention. The cards are filed away upright in a close-fitting file in alphabetical order according to the suppliers' names so that the flags for any one day fall immediately behind each other. Day by day the follow-up clerk removes from the file the purchase orders due for attention and takes whatever action is required—telephoning or writing the vendor in regard to the matter. A record of this action is noted on the order in the space provided and the card is refiled for attention on the date on which a reply should be received. The tenor of the vendor's reply is noted on the card in the proper place. This process is continued, using the copy as a tickler until the order is completely closed. Thus the follow-up file shows the deliveries due on every order outstanding, and is a complete record of the entire correspondence filed in one place and available for reference at any time.

When the number of outstanding orders is small, a tickler

system may be used, consisting of a reference card for each day on which notation is made of any order to be reviewed. When notice of shipment, which would ordinarily be an invoice or bill of lading, is received, a second notation is made on the record. The card is then refiled for the purpose of following up the transportation company or to make certain that the inspection of the purchase after its receipt proceeds as rapidly as possible and that no delay occurs in delivering the material to stores.

In case of any delay in receiving the material, the purchasing department must notify the requisitioner promptly. This is not a pleasant task because it means a disarrangement of a program and it is at the same time a confession of failure on the part of the purchasing department, which is perhaps innocent but nevertheless responsible. In any event the truth must be faced. To attempt to cover up the condition is to postpone the inevitable. A failure to report the matter promptly is not fair to the consuming department as it should be given a chance to adjust itself as best it can.

Following up the Transportation Companies

The purchasing agent's responsibility does not cease when the vendor has at length completed his part of the contract by shipping the goods, for the material must be secured from the transportation company. While as a matter of friendly co-operation the vendor may be asked to bring pressure to bear on the transportation company to expedite the delivery, using his more favorable position as a shipper who can give or withhold future business, the responsibility for getting the desired service from the transportation companies rests with the purchasing department.

In most large organizations a traffic department handles all dealings with common carriers. In other concerns the traffic work is divided between the purchasing department

and the shipping department, each attending to its own shipments; or the department having the greater amount of traffic work may handle all of it. When all shipments are in charge of a traffic department, both the purchasing and the shipping departments refer to the head of that department all questions and matters relating to traffic work. If there is no central department, the best procedure is for the follow-up organization to take care of all purchasing traffic work.

Transportation Charges

The transportation charges are a part of the cost of securing the material and the traffic organization must be continually alert to see that shipments are made by the least expensive routing consistent with the speed required. The choice of transportation service is obviously determined by time and cost. A local delivery service is the most reliable of all means of communication and, while ordinarily restricted to local limits, it may be extended for wider service in case of emergency.

For some shipments there is little to choose between mail, express, and freight. Mail for small shipments is the least expensive method and should be as speedy as any other service. Mail service includes delivery at the destination but it necessitates the shipper's delivery of the package to the post-office or its substation and is without free insurance for damages or loss in transit.

Express companies, on the other hand, pick up and deliver packages and at the same time give free insurance up to \$50 for a single charge. Within a certain limit, express is as inexpensive as freight and offers more prompt and better service. The privilege of routing must be waived when the package has been delivered to an express company.

Freight service, though slower, is usually the least expensive for all shipments which cost over \$1. It includes no trucking

at either the place of shipment or delivery. However, it is to be preferred when time permits and the material to be transported is of sufficient bulk or weight.

Freight Rates

There are various schedules of rates for freight shipments and each kind of material has a class rate. Rates are based fundamentally upon the cost of the services rendered and upon "what the traffic will bear." Small material of high value bears a relatively high transportation rate, while bulky material of low value commands a small rate. These two fundamentals are modified by the length of the haul, competition, and the relation of the revenue of the railroad to the capital invested.

In computing freight rates, every commodity is placed in some classification and each classification is given a separate rate. In general, the higher the value and the smaller the bulk of the article, the higher the charge for the class to which it belongs. There are special exceptions, however, to the rule and certain commodities packed in various ways to make handling easy are grouped in more advantageous classifications than they would otherwise be. Again, certain commodities have been given advantageous rates to get them into the market. The reasons for some of these exceptions are hard to understand, but they are established and as long as they exist they should be taken advantage of.

There is a decided difference between the freight rate on carload and less than carload shipments. A minimum carload is about 30,000 pounds, and the freight rate in the majority of cases is 60% of the "less than carload" rate. Whenever possible, the purchasing department should order in carloads, and the cars should be as large as possible. In addition to the lower rate, carload shipments are given other advantages, such as free lighterage and switching privileges, and position in through-trains not subject to frequent transfers or delays.

The privileges of milling and fabrication-in-transit are also allowed. This means that a carload of raw material, such as wheat or steel, may be sent to a mill en route to the destination to be milled or fabricated and then forwarded to its destination at practically the through rate between the point of origin and destination.

The long and short haul rates are based upon the principle that a long haul without transfer will require no more handling than a short haul and that the initial charge for handling should be the same regardless of distance. Western carriers operating in districts where the traffic is relatively sparse are allowed a higher tariff than eastern carriers operating in districts rich in traffic, in order that the net revenue may bear a relation to the capital invested sufficient for the payment of dividends or interest. In southern territory, rates are modified to assist favored cities to maintain their position as jobbing centers.

Competition between railroads, steamship lines, and electric or water routes before the day of regulated tariffs, cut certain tariffs for various routes and commodities and for favored shippers far below their actual and proper cost. The regulated tariffs, established under the necessity of maintaining competition, now fix the rates. However, when the rates were regulated many of the existing cuts for certain routes and commodities were confirmed in the new tariffs and still exist. Hence the traffic man will carefully investigate to determine the method of shipment under the most favorable rate. Competition today is restricted to the service a road renders to shippers, and a fertile field for the exercise of the traffic manager's tact is to obtain from the competing roads all the service possible.

Bills of Lading

As a preliminary to shipment, a bill of lading is made out by the shipper in triplicate, the first copy always being referred

to as the "original" and the others as the "copies." The railroad company indorses all copies, retaining one copy and delivering the others to the shipper. The original is forwarded to the consignee, who, if he is unknown to the railroad company, must surrender it before the goods will be delivered to him unless he can in some way prove that the material is for him. The conditions under which a carrier accepts a shipment are printed on the back of the bill of lading. They should be thoroughly understood by every shipper.

Bills of lading are of two kinds: "straight bills" and "order bills." The consignment covered by a straight bill of lading cannot be delivered to any party other than the party named thereon. An order bill of lading can be indorsed from party to party and the consignment covered will be delivered upon presentation of the original by any party whom the last indorser may indicate. It should be used whenever the material is to be shipped C.O.D.

Demurrage and Damage Claims

A penalty known as a "demurrage" charge is incurred by the recipient of a car if he fails to unload it within the period of time allowed. The charge is made on a daily basis. The traffic organization, as a matter of economy, will avoid such charges by promptly unloading its cars as soon after arrival as possible.

In case of damage to material in transit, the party who has paid the transportation charges must make the claim against the transportation company. The procedure as a rule is slow and consists in making a formal report to the railroad company of the circumstances of the loss and the extent of the damage. The railroad company may ask for additional information and for sufficient reasons refuse to recognize the validity of the claim. The recovery of small losses is so protracted as not to be worth the correspondence involved and

only serious losses warrant the trouble of making and following up a claim.

The Interstate Commerce Commission has approved a standard form for the presentation of claims. While its use is not essential it is convenient for the purpose, though any letter incorporating the facts serves equally well.

Routings

A knowledge of the possible routings between given points often results in saving time and money. For instance, several New England cities are connected with New York City by both rail and boat. One steamship line jointly uses a pier with a western trunk railroad line. Thus western shipments routed via this trunk line and this boat line are transferred between the two carriers much more quickly than if sent by an all-rail route, as the transfers of the New England railroad lines are thereby avoided.

Whenever specifying a routing or method of shipment, the purchasing department must never begrudge any increase in transportation cost necessary to secure materials in emergencies. Express, telephone, or telegraph charges should not be compared with the value of the item in such cases. For instance, a repair part for a stoker cost nearly \$40 in express charges although its selling price was only \$14.50, but the urgency justified the expense.

Discontinuing the Follow-Up

The follow-up work of the purchasing department ceases only when the receiving department receipts for the delivery of the material by the transportation agency. If the shipment is not in apparently perfect condition, the receipt must clearly state the condition of the material as received.

In large plants, the receiving department lists all parcels received on a duplicate record like Form 79, for convenience

in inspecting the material and for immediate notification to the purchasing department of what is received. Small plants complete the receiving routine early enough as to not require this record. The form shows the carrier, the consignors, their

SHIPMENTS RECEIVED VIA		BETWEEN	M & M	DATE	
CONSIGNOR	ADDRESS	NO. OF PARCELS	CONTENTS OF SHIPMENT	QUANTITY IN PURCHASE ORDER NO.	MATERIAL RECEIVED REPORT NO.

Form 79. Record of Purchase Material Received (in duplicate)
(Size 8½ x 11.)

The form may be used for several different transportation agencies by writing "Via _____" across the body of the sheet, dividing the form into as many parts as desired.

addresses, number of pieces in each shipment, the number of the purchase order against which the shipment applies, and, if possible, the contents of each parcel. All except the last item of this information should be marked on the package as required by the conditions of the purchase order. The serial number of the purchased materials received report for each item is noted and copy 1 is forwarded to the purchasing department follow-up clerk, while copy 2 is held pending the return of the inspectors' reports as described in the next chapter.

The purchasing department can be considered as having effected the delivery, for the material will be ready for use following the formal inspection of its suitability for the purpose for which it was ordered.

CHAPTER XXVII

THE COMPLETION OF THE PURCHASE CONTRACT

The Purchaser's Obligation

When the material has been delivered and the purchaser has given his receipt to the transportation company, the purchase contract is still incomplete. The buying concern has yet to ascertain that it has received what was contracted for and it has yet to pay the bill.

Unless otherwise stated in the contract, the vendor's invoice is not usually settled until the purchaser has received the bill and completes his inspection of the goods to determine whether his specifications as to quantity and quality have been met. If, however, the contract calls for payment on a definite date, within a given period of time, there is a distinct obligation upon the buyer to fulfil his part of the agreement regardless of whether the vendor forwards his invoice promptly. The invoice is merely a written statement that the vendor has fulfilled his part of the contract and that he expects prompt payment. It is business usage to submit this paper, with the result that it is now used as the basis for determining the accuracy of the vendor's charges. But should the vendor fail to furnish an invoice, it is correct procedure for the buyer to make out an invoice charging himself for the goods at the contract price and to use this as his means of settlement.

Payment of the Invoice

The use of the invoice for checking the quantity and price of the goods results in the almost universal custom of deferring payment until the invoice arrives. Nevertheless,

its failure to arrive does not exempt the purchaser from his obligation to pay promptly. The purchaser satisfies himself that he has received what he ordered, not as a service to the vendor, but for his own convenience and as a part of his own contractual obligation. He should start the procedure leading to authorization of payment, even though not all papers involved in the transaction have been received.

As a rule, the invoice will arrive before the purchased materials received report (Form 82, pages 386, 387) reaches the purchasing department. Should, however, the invoice be delayed or should the shipment be of a local nature, the materials received report often arrives before the invoice. Since time is required for adjustment in case of any discrepancy, it behooves the purchasing department to begin the inspection and count of a shipment as soon as it is received and to have an elastic and flexible system by which authorization can be initiated from either the invoice or the receiving report. It is not creditable to a purchasing department to be less zealous in seeing that its obligations are promptly met than in seeing that deliveries are promptly made.

The follow-up interest in these papers discussed in the previous chapter extends only to the knowledge of where the goods are located. The discussion of their origin and the methods of checking belongs to this last stage of the purchasing course. The machinery of receiving and checking goods, of comparing receipts with invoices, and of completing the processes that lead to the payment of the obligation, must move with accuracy and precision but must not lag.

The procedure of handling invoices is not well standardized and the methods in use are nearly as many as the concerns employing them. It is in this phase of purchasing that the variations in procedure are most numerous and the need of greater uniformity most pressing. One point of departure is the division of work between the accounting and the purchasing

departments. The division usually has been established by the organization's development and the personalities and predilections of the two department heads. Usually the accounting department is the older. Perhaps at the beginning when the concern was small, every department made purchases, and a single clerk performed all the phases of the checking, and the accounting and auditing of all invoices and the adjusting of all differences if any were discovered. With the purchasing department's establishment the accountants may have continued to perform their earlier functions from which the new department may have been unwilling or unable to relieve them. It is, however, on the purchasing department that the responsibility for originating all that pertains to the invoice should rest. It is not only logical but expedient that it alone should be responsible for the steps which precede the acceptance of the invoice—viz., its complete checking.

Registration of the Invoice

A typical invoice is shown in Form 80. Its arrival sets in motion the series of operations culminating with the payment of the bill completing the purchaser's obligations under the contract. If the invoice presents no discrepancies there is no reason why it should not be completely checked within twenty-four hours of the receipt of the goods, and the purchasing department, if it is to be considered as efficient, must be prepared and able to finish the work in that time when necessary.

To prevent misplacement, invoices usually are numbered serially in the order of their receipt and a record is made, showing the invoice number, the name of the vendor, the invoice date, amount, and the date payment should be made. The invoice number is then prominently written upon its face. This registration, although properly a part of the accounting department's record-keeping, can be equally well done by the purchasing department, thus saving time in the handling of

THE SELLING COMPANY							
New York, N.Y.							
To <i>The Buying Company</i> New York, N.Y.						DATE	
YOUR ORDER NO.				OUR ORDER NO.			
SHIPPED				VIA			
TERMS				F. O. B.			
QUANTITY	UNIT AND DESCRIPTION	LIST PRICE	DISCOUNTS	NET	EXTENSION		

Form 80. Typical Invoice. (Size $8\frac{1}{2} \times 5\frac{1}{2}$.)

the invoice. If the accounting department keeps the record, incoming invoices must go to it for registration, after which they are sent to the purchasing department for examination as to correctness. If the purchasing department does the work of registration, each record sheet or card when filled out is forwarded to the accounting department which will make certain that all invoices are received after being passed for payment.

The Flagging of Invoices

Another method of recording the receipt of invoices is by means of an "invoice flag," such as is shown in Form 81a. The flag is divided by a perforation into two sections or slips numbered serially. As a new invoice is received the left-hand section of a flag is gummed to it, the necessary data as to amount and terms of payment are noted on both sections, and the number of the flag is written on the invoice for safety in case the slip becomes detached. The ungummed section of the

flag is then detached and forwarded to the accounting department, where it is filed first in a tickler file, according to dis-

NO. 77597	NO. 77597
DISCOUNT DATE _____	DISCOUNT DATE _____
REC'D RD. _____ PASSED NO. _____	INVOICE DATE _____ ORDER NO. _____
TERMS _____ PRICE _____ AND T.O. _____	TO PURCHASING DEPT. _____ FROM PURCH. DEPT. _____
F.O.B. _____ EXTS. _____	VENDOR _____
QUALITY _____ QUANTITY _____	AMOUNT OF INVOICE _____ \$ _____
APPROVED FOR PAYMENT _____ FISCAL AGENT _____	DEDUCTIONS: CASH DISCOUNT \$ _____
DEDUCTIONS CASH DISCOUNT _____	TRANSPORTATION CHARGES \$ _____
TRANSPORTATION _____	REJECTED MATERIAL \$ _____
REJECTED MATERIAL _____	_____
_____	BALANCE BY CASH _____ \$ _____
VOUCHER NO. _____ VOUCHER SLIP _____	VOUCHER NO. _____ CHECK NO. _____

Form 81 (a). Invoice Flag for Entry of Checking

count date, and later, when paid, according to serial number, thus serving as an invoice register.

INVOICE NUMBER _____	DATE _____	PURCHASE ORDER NO. _____
RECEIVING REPORT NO. _____	DATE _____	
QUANTITY & QUALITY O.K. _____	PRICE O.K. _____	
EXTENSIONS O.K. _____	TERMS OF PAYMENT O.K. _____	
DEDUCTIONS _____	_____	
APPROVED FOR PAYMENT _____		
DISTRIBUTION _____		
FREIGHT, ETC. _____		
ENTERED STOCK RECORD _____	ENTERED VOUCHER REGISTER _____	

Form 81 (b). Invoice Rubber-Stamp to Replace Flag

As the invoice is checked the fact should be entered on the stub of the flag, which provides ample space for checking data

and for the notation by the purchasing and accounting departments of all deductions to be made before payment. Moreover, as it remains attached to the invoice after payment, there is always available a complete record of the amount deducted and the net amount paid. Sometimes these data are recorded by rubber-stamping either the face of the invoice if space permits or else the back, with a form illustrated in Form 81b. When the number of invoices is large, the entry of data on the back makes them difficult to handle for ready reference. The flag is the better device.

After an invoice has been flagged it should be compared with the purchase order in the follow-up file and the invoice recorded on the order in the space reserved for the purpose. The object of this entry is to furnish the follow-up clerk with the information he requires and to avoid paying an invoice a second time. While such a duplicate payment at first seems unlikely to happen where the clerical work is done systematically, it is of comparatively frequent occurrence in every organization that fails specifically to provide against it. Many vendors regularly present their bills in duplicate as a convenience to the buyer, for checking purposes, or the material contracted for may be shipped in two lots, and an invoice be rendered for the entire quantity with each shipment. Whatever the cause of duplicate payments, there is always a possibility of their occurrence, especially when an invoice is handled in several departments before final payment. The purpose of noting the invoice number upon its corresponding purchase order is to draw attention to the fact that the invoice covering that order has been received and thus a duplication is immediately noticed.

Checking the Invoice

In all properly organized procedures the checking of invoices follows a definite and standard route, so planned as to

avoid all unnecessary work and effort but flexible enough to obviate the complete stopping of the checking because of a discrepancy or on account of any other circumstance. Furthermore, it must be very carefully performed. Even in most concerns considered as being efficient, this procedure is one affording opportunities for stopping very heavy losses of money. As each step of the checking is verified, the proper spaces on the flag should be initialed.

As soon as the follow-up entry is made, the invoice and the purchase order copy should be given to the clerk responsible for checking price and quantity shipped. When completed, the purchase order will be returned to be refiled in its proper place to prevent its being held too long for checking because of delay in receiving the material.

The work of checking the price, f.o.b. point, terms, etc., as stated on the invoice, consists of comparing each entry on the invoice with the corresponding entry on the purchase order and making certain that they agree. Each item that does agree should be proved correct by the checker before initialing the flag. Invoices covering emergency orders placed before a price was determined must be checked more carefully than those on which the price is quoted. They usually will require considerable time and investigation. For these, the checker should have available current price lists and records of past prices for the material from which he should be able to determine whether or not the price quoted is reasonable. Many prices will be higher than those previously paid, but if he knows the trend of the market for that class of material, he will have little difficulty in deciding whether or not to approve the price billed.

Trade discounts and the terms on which the payment is to be made should be very carefully noted. Trade acceptances received with invoices should remain attached until they reach the accounting department, with which rests the decision as to when and how the account is to be paid. The purchasing

department need feel no further responsibility. The next step is to check the invoice extensions with calculating machines. This clerk must be familiar with the proper interpretations of trade discounts.

Checking the Transportation Charges

The f.o.b. point of the shipment should be checked next. This part of the contract obligation can be hidden in so many ways that it requires most careful checking. The vendor may prepay the charges and then add them to the invoice. The buyer may be expected to pay them and to deduct them from the invoice amount. A careful examination of all transportation bills should be made to ascertain which charges, if any, apply thereto. As transportation bills must be paid within twenty-four hours after delivery, practically always they are on hand by the time the clerk is ready to check the invoice.

When submitting bills, the transportation agency presents a statement summarizing the individual items making up the total. Each amount is supported by a detailed slip showing source of shipment, weight, rate, etc., and how the amount is made up. These bills should be checked by the traffic department as carefully as the vendor's invoice, making certain that the classification of the material, the rate, and the extension are correct. Discrepancies should of course be adjusted with the transportation agency.

The bills and statements, after checking, are forwarded to the purchasing department. Here they are entered on the appropriate purchase order copy in the follow-up file so as to have all data relating to the invoice assembled in the same place and ready for checking. Each bill is also rubber-stamped, noting thereon the stores ledger account to be charged with its amount—the same account as for the material transported. If any of the bills are to be paid by the vendor, they are marked to be charged to a "Freight to be Deducted" account.

The bills are then forwarded to the accounting department for vouchering in the same way as described later for vendors' invoices.

The checker is now ready to check the transportation charges. If transportation was prepaid and is included in the invoice, it should be counted as part of the charge if the shipment should be f.o.b. shipping point. When f.o.b. destination, the charge should be crossed off. If the buyer paid the charge and the shipment was to be f.o.b. destination, the amount should be entered on the flag as a deduction to be credited to the "Freight to be Deducted" account. If the buyer stands the charge, the amount should be entered on the flag as an additional cost of the material.

If the vendor's invoice includes the freight charges, their amount should be checked as if an original bill rendered by the transportation concern. When a vendor has delayed shipment on his own responsibility, he may ship them by express, C.O.D. If the goods are bought f.o.b. shipping point the purchaser is responsible only for a freight charge and is entitled to deduct from the invoice the difference between the express and the freight charges.

Receiving and Checking the Goods

As discussed in previous chapters the receiving department is usually responsible for the inspection of incoming shipments as well as their receipt. The larger the concern, the more important its work. The volume of business of a small concern may not justify the employment of a special receiving and inspection clerk, in which case the work devolves upon the storekeeper.

Although the receipt given to the transportation agency indicates that the shipment has been received in apparently good condition, this acknowledgment does not waive any claim for damages if, after unpacking, goods are found to be broken

PURCHASED MATERIALS RECEIVED REPORT										COPY 1	
RECEIVED FROM										ORDER NO.	
VIA										DATE RECEIVED	
CAR INITIALS AND NUMBER										DATE WRITTEN	
NO. OF PACKAGES										GROSS WEIGHT	
INVOICE NO.											
MATERIAL SYMBOL AND LOCATION		QUANTITY		NET PURCHASE CHARGE		TRANSPORT. CHARGE		TOTAL COST		UNIT COST	
SYMBOL		RECEIVED		REJECTED		ACCEPTED					
LOCATION		DESCRIPTION									
SYMBOL											
LOCATION		DESCRIPTION									
SYMBOL											
LOCATION		DESCRIPTION									
SYMBOL											
LOCATION		DESCRIPTION									
SYMBOL											
LOCATION		DESCRIPTION									
SHOWN		INVOICE CHECKED		TRANSPORTATION INVOICE CHECKED		CHARGES ENTERED AND COSTS FIGURED		ENTERED ON STORES CONTROL			
INSPECTION DEPT.											

Form 82 (a). Purchased Materials Received Report (copy 1). (Size 8 1/2 x 5 1/2.)

PURCHASED MATERIALS RECEIVED REPORT										COPY 2	
RECEIVED FROM								DATE RECEIVED	DATE WRITTEN		
LOCATION	DESCRIPTION										
THE ABOVE MATERIAL IS IN THE STOCKROOM READY FOR USE.	TAG MADE OUT BY	VALUE ENTERED BY	VALUE EXTENDED BY	ADDED TO STOCK RECORD	STORES CHARGED	ORDER CREDITED					
	STORAGE DEPT.										

PURCHASED MATERIALS RECEIVED REPORT										COPY 3	
RECEIVED FROM								DATE RECEIVED	DATE WRITTEN		
LOCATION	DESCRIPTION										
SYMBOL											
LOCATION	DESCRIPTION										
RECEIVED THE ABOVE ACCEPTED MATERIAL FROM THE RECEIVING DEPARTMENT											
<div style="text-align: right;"> RECEIVING DIVISION, STORAGE DEPT. </div>											

Form 82 (b). Purchased Materials Received Report (copies 2 and 3)

or short due to pilfering or the loss of a package. To insure the accuracy of the inspection and count and to guard against the possibility of the clerk shirking his task, it is customary not to furnish him with any information relative to the quantity called for by the original order. He makes his count independently and enters his figures on a purchased materials received report (Form 82) made out in triplicate. Spaces are provided on these reports for the vendor's name, the order number, and the quantity received and the quantity rejected, if any. The copies are signed by the inspection clerk and distributed, one to the purchasing department for checking the quantity of the invoice, another to the stores records after the material has been sent to the storeskeeper, while the third copy is signed by the stores clerk and filed by the receiving clerk for his own protection. In a small concern, the receiving department's copy of the original purchase order serves as an adequate receiving report. Spaces are provided for recording the receiving data after which it is routed via the materials control department to the purchasing department.

The inspection of the quality of purchased goods is a technical problem that every concern solves in its own way. But if the quality is finally decided to be unsatisfactory as a result of careful tests, the quantity to be rejected is noted on the materials received report, and in addition a rejection report (Form 83) is made out, to furnish more detailed information than can be shown on the materials received report. The general information on the rejection report is similar to that on the materials received report, but the former describes the tests made and why the material fails to meet the requirements. This information enables the purchasing department to prepare its claim against the vendor.

When a discrepancy appears between the quantity shipped and the quantity received, the purchasing department should instruct the receiving clerk to inspect the packages again and

<h2 style="margin: 0;">DEFECTIVE MATERIAL REJECTION REPORT</h2>	
<p>TO PURCHASING DEPARTMENT DATE _____</p> <p>THE MATERIAL NOTED ON THE FACE OF THIS REPORT HAS FAILED TO PASS INSPECTION FOR THE FOLLOWING REASONS: _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>WE RECOMMEND _____</p> <p>_____</p> <p>PLEASE ADVISE AS TO WHAT DISPOSITION SHOULD BE MADE OF THIS MATERIAL</p> <p>_____</p> <p style="text-align: right;">RECEIVING DEPARTMENT</p>	<p style="text-align: center;">INSTRUCTIONS FOR DISPOSITION OF ABOVE MATERIAL:</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>CONDITION OF STOCK:</p> <p>ON HAND _____</p> <p>ON ORDER _____</p> <p>STORES RECORD CLERK _____</p> </div> <div style="width: 45%; text-align: center;"> <p>_____</p> <p>PURCHASING DEPARTMENT</p> </div> </div>

Form 53. Back of Defective Material Rejection Report. (Size 8½ x 5½.)
The face is used as copy 4 of Form 52.

count the items in an effort to locate the missing articles. If the material billed on the invoice is of the same quantity and quality as that reported as received, the invoice checker makes a notation to this effect on the invoice flag, attaches the materials received report and the transportation bill, if any, to the invoice, and forwards the documents to the clerk in charge of the follow-up file of purchase orders for entry of the necessary data on his records, as next to the last step in the approval routine.

Adjustment of Discrepancies

Before being considered as finally approved for payment, the invoice should be reviewed by some departmental authority—usually the purchasing agent. A convenient method of bringing to his notice any discrepancy is illustrated in the “memorandum of discrepancy in invoice” (Form 84). With the necessary papers in front of him, the purchasing agent or other executive is in a position to decide whether the matter is of sufficient importance to justify negotiations with the vendor. The adjustment of small discrepancies may not be worth the time and effort involved. There is no necessity, however, to await the completion of the checking of the invoice before bringing discrepancies to the attention of the purchasing agent. If a discrepancy memorandum is made out when the error is first noticed, the checking can proceed, as the memorandum furnishes adequate data for action in securing an adjustment, while the absence of an approving signature in the appropriate space on the invoice flag signifies that the approval is incomplete.

The adjustment of claims requires careful attention, tact, and patience. Whether the claims are settled or not before the checking is completed, no invoice should remain unpaid when payment is due pending negotiation with the vendor. Instead, the purchasing agent should decide whether to deduct the

DATE	CLAIM NUMBER												
MEMORANDUM OF DISCREPANCY IN INVOICE													
ORDER NO. DATE OF ORDER INVOICE DATE INVOICE NO. (OUR) VENDOR	ORDER SHIPPED BY ORDER RECEIVED SERIAL NUMBER (FILER)												
TO SUPERVISOR OF INVOICE DIVISION PURCHASING DEPARTMENT THE FOLLOWING DISCREPANCY APPEARS IN THE ABOVE ORDER:- <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">PRICE QUOTED</td> <td style="width: 50%;">BILLED</td> </tr> <tr> <td>TERMS OFFERED</td> <td>BILLED</td> </tr> <tr> <td>FREIGHT OFFERED F.O.B.</td> <td>BILLED F.O.B.</td> </tr> <tr> <td>QUANTITY ORDERED</td> <td>BILLED</td> </tr> <tr> <td>QUANTITY RECEIVED</td> <td>ACCEPTED</td> </tr> <tr> <td>QUALITY ORDERED</td> <td>RECEIVED</td> </tr> </table> <p>REMARKS: MATERIAL BILLED, ETC.</p> <p style="text-align: right; margin-top: 20px;">SIGNED</p>		PRICE QUOTED	BILLED	TERMS OFFERED	BILLED	FREIGHT OFFERED F.O.B.	BILLED F.O.B.	QUANTITY ORDERED	BILLED	QUANTITY RECEIVED	ACCEPTED	QUALITY ORDERED	RECEIVED
PRICE QUOTED	BILLED												
TERMS OFFERED	BILLED												
FREIGHT OFFERED F.O.B.	BILLED F.O.B.												
QUANTITY ORDERED	BILLED												
QUANTITY RECEIVED	ACCEPTED												
QUALITY ORDERED	RECEIVED												
DISPOSITION OF DISCREPANCY <p style="text-align: right; margin-top: 20px;">SIGNED</p> <p style="text-align: right; margin-top: 10px;">SUPERVISOR OF INVOICE DIVISION PURCHASING DEPARTMENT</p>													

Form 84. Memorandum of Discrepancy in Invoice. (Size 8½ x 11.)
 To be filed with the invoice, unless claim is made against vendor; then to be replaced by Form 85 and filed with the correspondence.

disputed amount or to pay the invoices in full, and consider the amount in dispute as a claim receivable or an advance payment. Strictly speaking, it is more advantageous to the buyer to hold back all or part of the disputed amount, especially in dealing with an unknown or unreliable firm. The accounting is thereby also simplified because the deductions entered on the flag will be considered in making the entries in the general books of account. On the other hand, when the vendor is reliable it may be better business practice to pay the invoice in full and trust to the vendor to make the proper adjustment.

Discrepancies in favor of the vendor are, of course, easily adjusted by crediting him with the amount. But if for any reason the purchasing department cannot approve an invoice, a memorandum of discrepancy should be retained pending settlement and the invoice passed for payment and entered in the general books. If later the adjustment is decided in favor of the buyer and the invoice meanwhile has been paid in full, the vendor may either send a replacement shipment or the buyer may charge him by means of a countercharge memorandum (Form 85). If the decision is in favor of the vendor and his invoice has not been settled in full, the buyer requests the accounting department, by the use of a "credit to vendor memorandum" (Form 86), to include the deducted amount in the next payment to the vendor, or by using a "requisition for check" (Form 87), requests that the vendor be paid at once.

Payment of Invoice

It is the duty of the purchasing department to forward the invoice with any other papers to the accounting department via the materials control department, in sufficient time to take advantage of the earliest discount date. In Chapter V, "Pricing the Stores Record," and in Chapter X, "Costing of Orders," the handling of the values of manufactured mate-

COUNTERCHARGE MEMORANDUM				CONTRA VOUCHER NUMBER	
TO ACCOUNTING DEPARTMENT:			DATE _____		
PLEASE CHARGE _____					
ADDRESS _____					
THE SUM OF _____ DOLLARS					
ON ACCOUNT OF ADJUSTMENT ON INVOICE NO. _____ DECIDED IN OUR FAVOR.					
CREDIT TO		ACCT. NO.	AMOUNT		APPROVED _____
		ENTERED IN CREDIT VOUCHER REGISTER		HOW PAID	DATE PAID
PURCHASING DEPARTMENT					

Form 85. Countercharge Memorandum. (Size 8½ x 5½.)

CREDIT TO VENDOR MEMORANDUM				VOUCHER NUMBER	
TO ACCOUNTING DEPARTMENT:			DATE _____		
PLEASE CREDIT _____					
ADDRESS _____					
THE SUM OF _____ DOLLARS					
ON ACCOUNT OF ADJUSTMENT ON INVOICE NO. _____ DECIDED IN FAVOR OF THE ABOVE NAMED PARTY.					
CHARGE TO		ACCT. NO.	AMOUNT		APPROVED _____
		ENTERED IN VOUCHER PAYABLE REGISTER		DATE PAID	CHECK NO.
PURCHASING DEPARTMENT					

Form 86. Credit to Vendor Memorandum (red ink). (Size 8½ x 5½.)

REQUISITION FOR CHECK			VOUCHER NUMBER	
TO ACCOUNTING DEPARTMENT:			DATE _____	
PLEASE DRAW CHECK PAYABLE TO _____				
FOR THE SUM OF _____ DOLLARS				
IN PAYMENT OF ADJUSTMENT ON INVOICE NO. _____ DECIDED IN FAVOR OF THE				
ABOVE NAMED PARTY _____				

CHARGE TO	ACCT. NO.	AMOUNT	APPROVED _____ PURCHASING DEPARTMENT	
PAID BY CHECK NO.		WRITTEN BY	ESTIMATED CHECK-UP BY	CHARGED

Form 87. Requisition for Check. (Size 8½ x 5½.)

rials, crediting the amount to work in process and charging it to stores control accounts, and the entering of the total and unit values on the stores record, was discussed. As mentioned in those chapters, a similar procedure is followed for purchased materials. The purchasing department forwards approved invoices to the stores records for pricing the record with the invoice cost less, of course, any deduction such as shortages, trade discounts, etc. Any transportation charges shown are included as a part of the total cost. This latter amount is already charged to the proper stores control in vouchering and paying transportation agency's bill. The receipt of the material has been entered previously from the materials received report.

The work of the accounting department is properly to account for the purchase, to pay the debt, and to make the proper records of the transaction as soon as an examination of the invoice shows the approval to be satisfactory and that the invoice has been entered on the stores records. The invoice

is then ready for vouchering and registering in the vouchers payable register (Form 88).

A voucher can be considered as any properly approved request for payment of a payable. Of course, not all are preceded by the purchase routine. Some requests for payment originate in other ways as a "requisition for check" (Form 87), for pay-rolls or notes payable, or for bills covering service not purchased through the purchasing department. However, every payment must be preceded by some formal and approved authorization of payment.

The voucher register is divided into two sections showing the accounts to be debited and credited in addition to the descriptive section at the left. In the columns headed, "Name of Payee" and "Description" are entered the name of the creditor and a reference as to service rendered, whether material, labor, etc.

The credit side is made up of columns headed, "Vouchers Payable," "Freight to be Deducted," and "Miscellaneous." In the first column is entered the gross amount of the invoice before any cash discounts are deducted and after any miscellaneous amounts are deducted. In the "Freight to be Deducted" column is entered the amount, if any, to be deducted from the invoice, which amount, as previously explained, was charged to this account when the transportation bill was paid. In the "Miscellaneous" column are entered any miscellaneous deductions with the account symbol to be credited. On the debit side are the various distribution columns headed with the class names of the accounts to which invoices are charged, such as "Stores," "Expense Ledger," "Capital Assets," and "Miscellaneous," in accordance with the distribution entered on the voucher. Each distribution column as illustrated in Form 88 should have a detail account symbol column for each amount column whenever debits to more than one control account are entered in the one column. During the month the individual

amounts may be posted to the proper accounts, or at the end of the month a recap may be made and entered at the foot of the column. Each entry in the Expense Ledger column is supported by an expense ledger slip (Form 26, page 127).

As the pages of the register are filled with entries, the columns are totaled and the amounts carried forward to the top line of the next page. The total of the debit columns must equal the total of the credit columns, thus proving the correctness of each entry and the footings. At the end of the month, the columnar totals or such recaps as have been made thereof, are posted to the proper ledger control accounts to which they belong.

Following registration in the voucher register, all approved invoices are filed by vendor pending payment. The tentative date of payment is indexed by a tickler card or the stub of the invoice flag (Form 81). Each day the ticklers for payables due that day are matched with the invoices which are then sorted by payee and by discount rate, so that each little stack contains all invoices from one vendor and having a common discount rate. Each day the treasurer signifies the total amount which can be paid. The accounting department then keeps the payables being prepared within that amount, giving preference to those items which are most urgent.

These invoices are then listed on the remittance letter (Form 89). The form is in triplicate and includes the bank check. The invoices grouped by discount rate should be listed, entering invoice date, number, invoice amount, deductions, if any, cash discount and the net amount. The discount for individual invoices need not be entered if the discount for a group having a common rate can be reckoned as one amount.

The net amount column is then totaled, any further deductions such as charge-backs are entered, and the total net amount to be paid is reckoned. Then the upper part of the form, which is the bank check, is written out for this total net amount. The

three copies of the form with the invoices should be forwarded to the auditor who, after checking the correctness of the vari-

THE BUYING COMPANY				NO. 12987			
				NEW YORK, _____ 192__			
PAY TO THE ORDER OF _____				\$ _____			
				_____ DOLLARS			
TO THE NEW YORK BANK, NEW YORK, N. Y.				THE BUYING COMPANY			
				_____ AUDITOR			
				_____ TREASURER			

THE BUYING COMPANY, NEW YORK, N. Y.				CHECK NO. 12987			
TO _____							

DATE	OUR REFERENCE NUMBER	MEMORANDUM	AMOUNT	DISCOUNT	OTHER DEDUCTIONS	NET AMOUNT	

Form 89. Remittance Letter (in triplicate). (Size $8\frac{1}{2} \times 8\frac{1}{4}$.)

ous entries, will approve the check as regards the correctness and approvals of the bills.

The papers are then separated—the original and duplicate of the remittance letter are forwarded to the treasurer, and the triplicate with the invoices, etc., attached, to the accounting department where the payment of each voucher is noted in the voucher register, after which the papers are bound together and filed by vendor.

The treasurer signs the check section of the remittance letter original and forwards it to the payee. From the duplicate copy the cash disbursement register (Form 90) is written up to show the name of payee and the various debit and credit amounts. In the debit columns are entered any "miscellaneous" amounts taken from the remittance and not recorded in the voucher register, and under "Vouchers Payable" the amount of debt paid, which is the amount previously credited to the account in the voucher register. On the credit side are entered any miscellaneous items, the "Discount Earned," and the check amount and number. The duplicate copy is then filed by check number.

The accounting for the purchase is now completed—the bill paid, stores charged, and the material in the storesroom. The purchasing transaction is completed.

CHAPTER XXVIII

SOME LEGAL ASPECTS OF PURCHASING

Necessity of Familiarity with Law

In the purchasing agent's every-day relations with vendors, he is constantly dealing with matters which are governed by law. For his information and protection, therefore, he should be familiar with the legal rules applicable to those activities in which he engages. It is the purpose of this chapter to explain those features of the law of contract and of agency so that every purchasing agent should understand.

"Ignorance of the law excuses no one." This is a legal maxim with a twofold application for our purposes. In the first place it is important that all parties to a contractual arrangement should assure themselves that their acts are in accordance with the law. In the second place they should understand fully the legal consequences of lawful acts. Failure in either of these directions is not excused by ignorance or good intentions.

What Constitutes Our Law

Law in the technical sense means any rule of conduct, prescribed and enforced by governmental authority. Not all the laws in operation today are written. Neither have they all at some time or other been enacted by legislative bodies. For, in addition to the statutes, we have the great body of "unwritten law" which includes all those customs and decisions of courts which through long recognition and application have all the force of written laws. Our treatment here, however, is confined to an exposition of the law as it is and so we are not primarily concerned with how it came to be established.

Definition of a Contract

[Whenever an agreement is of such a nature that it may be enforced in a court of law, it is called a contract] There are many agreements for the breaking of which the injured party can have no redress in a court of law. That is to say, they are unenforceable. To make a contract valid and enforceable, certain essential elements must be present, the most important of which are:

1. Agreement
2. Competent parties
3. Consideration
4. Legal object

Meaning of Agreement

The first essential of a contract is agreement. There must be assent to the same thing by the contracting parties. To use the technical phrase, "their minds must meet." An agreement usually results from an offer made by one party, which is accepted by the other party. The offer or proposal may be oral or written, and the acceptance may be oral or written. The simplest form of contract is an offer to sell goods at a specified price and an acceptance of the goods at that price. If this offer and the acceptance are made by letter, the two letters taken together constitute a complete written contract of sale. Certain features which have been described as being necessary in a purchase contract may be omitted and the law supplies them: e.g., when nothing is said as to terms, the law implies cash; when nothing is said about delivery, the law implies that the buyer will be entitled to delivery when he pays the price.

Acceptance of an Offer

The manner of the acceptance of the offer is one of the most important features of the contract. The offer must be

accepted in accordance with its *exact* terms. To accept an offer in any terms other than those in which it is made does not result in a contract. The party making the original offer *may* decide to accept the new terms, in which case a new and different agreement than was at first contemplated will be made; however, he has the privilege of rejecting the proposed new contract entirely.

If an offer is made to one person, another cannot accept it; and if open for a limited time, it must be accepted within that time. If no time is mentioned, then a reasonable time is intended. People cannot be held to offers made long ago and forgotten, nor after the circumstances which led to the offers have changed. What constitutes a reasonable time will depend on the circumstances of each case.

An offer should be accepted by the same method of communication that was used in its making, unless the party making the offer requests an answer by another method. If the offer is made by mail or telegraph, it is regarded as calling for acceptance by the same means unless the offerer expressly asks for a reply by some other means. The acceptance is effective and the contract is made as soon as the offeree has delivered a prepaid acceptance to the Post-Office Department or the telegraph company. The contract is complete even though the acceptance may never be received. At any time before acceptance, an offer may be withdrawn by giving notice of the revocation to the offeree.

Finally, to make an enforceable contract, the agreement between the parties must be one that can be proved, hence a written contract signed by both parties is the best evidence of agreement.

Value of Having Contracts in Writing

So far as purchasing agents are concerned, the inability to prove any legal agreement is a frequent source of trouble.

This is not due to any complexity of the law, but rather to the fallibility of the human mind and to a lack of proper care in seeing that the details of every important contract are put down in writing. Time after time it has been impossible for a buyer to protect himself against a breach of contract on the part of the seller because in accepting an offer or in placing an order he neglected to insert a definite date of shipment or delivery or a price as a part of the contract.

The importance of having contracts, whether of large or small consequence, in writing, is one which cannot be too much emphasized; and when a contract is in writing, it is equally important that it be in the most concise and unambiguous language possible. Whenever a purchasing agent finds it necessary to make a verbal agreement involving a future transaction, he should make a point of having it confirmed by writing. Much trouble and litigation would be saved were this course always followed.

The Parties to an Agreement

There must be at least *two* legally competent parties to every contract. The law clearly defines who are legally competent to contract. Generally all persons are able to bind themselves by contract—it is a positive right. But there are exceptions to the general rule. Certain persons are either totally incompetent, or of qualified competency. Persons judicially declared insane, minors, and intoxicated people are examples of those who may generally avoid contracts entered into by them. In the case of minors and insane persons, however, contracts for necessities are good.

At common law, married women could under no circumstances bind themselves by contract. The attempt was a nullity. By statutes, however, this disability has been to a large extent removed and generally today their freedom in this respect is as great as that of unmarried women.

Consideration

The third essential element of a contract is what is known as the "consideration." A mere promise by one party, the promisor, to do or not to do a certain thing, cannot be enforced by the party to whom made, the promisee. The law will not operate in behalf of such a one-sided arrangement. To be enforceable the agreement must provide that some legal detriment be suffered by the promisee. This legal detriment, this undertaking to do something that one is not legally bound to do, constitutes consideration. The value of the consideration as compared to the value of the promise is immaterial. The requirement of law is satisfied if the promisee undertakes to do or does anything which he is not already bound to do and which is legal in its nature.

In ordinary practice when no consideration is mentioned in a purchase order, it is understood that the buyer agrees to pay a reasonable amount for the goods and a contract is made. However, the determination of what is a reasonable price causes many disputes. Usually it will be determined as the market value at the time of delivery.

Lawful Purpose

The fourth element of an enforceable contract is that "the agreement must be made for the purpose of accomplishing some lawful purpose." An agreement to do anything contrary to law is unenforceable. An agreement to do anything which, while not directly contrary to any special statute, would be injurious to the good order, the health, or the morals of the community, is against public policy and would be unenforceable.

An agreement in restraint of trade is illegal. The Supreme Court, however, has decided that agreements in *reasonable* restraint of trade are not. Thus, when a person sells out his business to another he may agree never to engage in that business again within certain reasonable territorial limits—usually

the limits of the territory which his business actually covered. Such a contract is enforceable.

It is highly unlikely, however, that the purchasing agent will ever have occasion to be concerned with the lawful purpose of a contract. Sound purchasing precludes the possibility of unlawful purchases of any nature whatsoever.

Sale: Contracts

Although contracts are of varied nature, those in which the purchasing agent is interested are confined within narrow limits. He is interested primarily in only two kinds: purchases and contracts to purchase. Or, to express the same thing from the point of view of the vendor: sales and contracts to sell.

The distinction between the two is apparent from the definitions given in the Uniform Sales Act, which follow:

A sale of goods is an agreement whereby the seller *transfers* the property in goods to the buyer for a consideration, called the price.

A contract to sell goods is a contract whereby the seller *agrees to transfer* the property in goods to the buyer for a consideration, called the price.

The difference, then, between a sales and a contract to sell consists in this: Where the effect of the transaction is to pass title to the goods at once, delivery takes place and there is a sale; where title is to be passed at some later time, there is a contract to sell. For instance, a buyer is offered a lot of specific goods which cannot be duplicated. If he accepts the offer, the transaction is a sale—not a contract to sell. Delivery takes place at once although the seller may still have possession of the goods and the purchase contract may state delivery is “f.o.b. destination.” This statement regards price rather than the time of delivery.

The importance of the distinction between these two types of contract arises from the fact that where the title is there the

risk of loss rests, as well as the rights and liabilities of ownership generally. If fire destroys or thieves steal, he who holds title is the loser. On the other hand, any benefits arising from the thing owned belong to the owner. It should be one of the objects of the purchasing agent's concern, therefore, always to know whether he is negotiating a sale or a contract to sell.

Caveat Emptor

An important rule of general application in the law of sales is that of caveat emptor—"let the buyer beware." This rule is designed to make men careful when buying and to discourage resort to the courts. What the rule means as applied to specific articles is that when the buyer has opportunity to inspect such articles before purchasing, he is responsible for any defects in them or mistakes with reference to their character. This does not, however, excuse the seller if he deliberately conceals a defect. In such a case, the buyer may rescind the contract.

Express Warranties

If a buyer wishes to protect himself against the rule of caveat emptor, he may do so by exacting a warranty from the vendor. As a matter of fact, a transfer of commodities rarely takes place without some conditions or warranties as to quality, utility, or other characteristics of the commodities sold. Only warranties given by a seller to his customer hold, as warranties of one vendor do not pass on in case of resale.

An express warranty is a statement made by the seller about the quality, durability, working ability, etc., of the article sold, in order to induce the buyer to purchase. The purchaser must have bought the goods in reliance on that statement. If he relies on his own judgment and selects the goods himself, there is no warranty even though the seller made a statement of fact.

Any statement of fact or any promise by the seller in regard to the quantity, quality, or title of a commodity is an express warranty, if the natural effect of such a statement is to induce the buyer to purchase the goods relying on such statements. It must not be forgotten that the burden is on the buyer to see that each purchase is covered by the necessary warranties. It should also be borne in mind that a warranty should be in the most definite terms possible, such as a specification. If a seller is willing to warrant his goods, he will not be afraid to say so in plain language if the buyer insists upon it. If the seller is not willing to make a definite warranty, it is better for the buyer to know it beforehand and to realize that he is relying on his own judgment and can claim nothing from the vendor if the goods prove unsatisfactory. A written warranty prevents forgetfulness on the part of the seller.

Expressions of Opinion

It is important, though difficult in many cases, to distinguish between a warranty and a mere expression of opinion, unless the terms of the warranty are sufficiently explicit to define the exact conditions which the warranty is to cover. For example, the expression "best on the market" cannot be considered a warranty, inasmuch as no definite statement is made as to specific purposes for which the material may be better than some other material. Every vendor is allowed a certain liberty in "puffing" his wares. Many expressions, moreover, are cleverly worded to give the impression of being statements of fact, while still permitting the parties making them to escape legal liability. Any such phrase as "it is estimated," "there seems to be," "experts estimate," or any phrase which qualifies the simple statement of fact, makes the assertion a mere worthless expression of opinion. On the other hand, the expression "as good or better" than a specified product for some definite purpose may be considered a warranty.

Express warranties are usually insisted on by the buyer and in most cases are in the form of definite specifications, although they are frequently put forward by the seller in order to persuade the purchase of his goods rather than a competitor's.

Implied Warranties

In addition to so-called express warranties, in every sale transaction there are certain implied warranties, which the law requires the seller to make good. The most important warranties of this type may be defined as follows:

1. Warranty of title. That is to say, the seller has the right to sell the goods, or if it be a contract for future sale, that he will have the right to sell when the time for the sale arrives, and that the goods are free from any claim, charge, or encumbrance at the time of sale.

2. Fitness for purpose for which bought. If the buyer makes known to the seller the purpose for which he intends to use the goods, or if this purpose is known to the seller, there is an implied warranty that the goods are fit for the purpose. If, however, the buyer orders goods by their trade-names, the seller is relieved from any warranty that they are fit for his purpose, unless it can be clearly shown that in a contract for goods to be used for certain definite purposes, the seller definitely offered certain standard goods, under their trade-names as being fit for such purposes, as clearly set forth by the buyer.

3. Conformity with description. If the buyer orders goods by description there is an implied warranty that the goods furnished shall meet the requirements of the description.

4. Conformity with sample. If goods are bought by sample, the buyer can rely on the implied warranty that they are up to the sample.

The fact that certain implied warranties arise by operation of law or otherwise, should not prevent the buyer from obtaining positive written guaranties on all important purchases.

Destruction of Subject Matter

When the goods offered for sale do not exist at the time the agreement is made, and in addition are of a character that cannot be duplicated, no contract arises as the subject matter is without existence. In case subject matter of like peculiar character is destroyed, through no fault of the vendor, subsequent to the making of the contract and before the time for performance, although a contract has arisen, it is said to be discharged.

Where the contract is not for any *specific articles*, but only for so many feet of lumber, bushels of wheat, etc., the destruction of the wheat or lumber which the seller had at the time the contract was made would not excuse him from performing it. He must go out and buy more to replace what has been lost. In such a transaction the agreement of sale should be very definite as to the time when the ownership is to pass from the seller to the buyer. Much may depend on this fact.

Mistakes in Contracts

The mistakes possible in making a contract are of two kinds: a mistake as to whom one is dealing with, as to what the agreement is about, or what is to be done under the contract; and a mistake as to the quality or the value of the subject the contract deals with, or its legal effect.

A mistake under the first heading will mean that there is no contract. A party cannot be forced to observe a contract with someone with whom he did not intend to contract. The parties must be considering the same thing and must be agreed as to what is to be done about it, or there is no meeting of their minds and no contract. The fact of mistake is sometimes very hard to prove.

If, however, there was no mistake as to what the contract was about or what was to be done, the fact that either or both of the parties believed that the subject of the contract was

more or less valuable than it actually was, will not make any difference in its enforcement. An agreement has been made and both parties are held to it even if it means loss to one of them.

If a person knows that the instrument he is signing is a contract, and fails to read it, he will be bound by it even though it is a contract to do something entirely different from what he intended. No one should sign contracts without reading them. One does so only at his peril.

If, however, through the fault of some clerk in writing the contract, an error of some sort creeps into the written document so that it misrepresents the actual agreement between the parties—i.e., a clerical error—the court will order it to be rewritten to express what the parties agreed upon.

What Constitutes Fraud

If any false representation is made by a person who knows it to be false or has no positive belief or adequate knowledge in regard to the matter, intending to induce action by creating a false impression in the other party's mind, or to prevent him from investigating to find out the truth about the transaction, it amounts to a fraud. Fraud practiced on a party to a contract will excuse performance on his part. Misstatements about unimportant matters or mere expressions of opinion in recommending an article for sale, do not affect the contract. The buyer must allow for overstatements of opinion by the seller as to the virtues of the article he is selling.

If the reading of a contract indicates fraud, the injured party may refuse to be bound by it or he may claim damages for the injury sustained. This rule holds good also whenever the legal effect of the contract has been misrepresented or when a fraudulent value is placed on that which is being bought or sold. An injured party must act promptly after he discovers fraud. By delay he may lose his rights.

If some of the material representations by which one party induces another party to enter into the contract are fraudulent, the fact that most of the representations are honest will not make the contract good. But if the fraudulent representations refer to matters of no consequence and are not material to the contract they will not affect it. Also, if the party relied on his own judgment in the matter, rather than upon what was told him, the misrepresentation will make no difference.

Fraud in any of the negotiations leading up to a contract will nullify it. If fraud has prevented the party from making an independent investigation, or if it has led him astray in regard to the facts, it will render the contract voidable.

As has been already said, where fraud occurs the party entering into the contract may refuse to perform his share of the agreement. If the contract has already been carried out, he may recover his property or its value. If he wishes to annul the contract, however, he must return anything he has received under it unless it has been consumed or destroyed at the time he discovers the fraud. Should he prefer, he may let the contract stand and claim damages for whatever loss he may have suffered.

Alteration of Contracts

The parties to a contract may alter it if they can agree on the changes to be made. If it is a written contract, one of the parties may make alterations in the contract itself with the consent of all the other parties, or the parties may make a new written contract.

If the same parties make a new agreement about the same subject which is entirely inconsistent with the old agreement, the old agreement will be regarded as set aside by the new. If, however, there is any part of it which is not inconsistent with the new, that part still remains enforceable. Any alteration in a written contract by one of the parties without the consent

of the other, makes the contract of no effect as against the other, as this amounts to fraud. If a person, not a party to the contract, and not acting for any of the parties to it, should make alterations in it, they would be treated as though they did not exist. The nature of the original contract could be proved by the testimony of the parties, and the contract would be enforced as it stood before the alterations were made. The best way to change an existing contract is to make a new written agreement signed by all the parties.

It is not safe to leave any written instrument with unfilled blanks. A contract should always be stated in the most simple and intelligible language, and the parties should go over it carefully to make sure that all of the terms are clear and complete.

Interpreting a Contract

Though a contract should be so clear that its meaning may be easily understood, as a matter of fact many agreements are far from clear and all sorts of disputes arise over their meaning. A contract is interpreted so as to carry out the intention of the parties as nearly as may be. The court will try to interpret a contract in such a manner as to make it lawful and enforceable. In this matter, law and common sense coincide.

In getting at the intention of the parties where the contract is not clear, anything which is unessential and tends to confuse the meaning will be disregarded. If there are two statements which absolutely conflict, the court will consider that the first gives the true meaning and will disregard the contradiction.

The parties may bring in evidence to show the meaning of any technical terms used, or to prove some well-recognized custom or usage of business which will explain the meaning of certain terms, or which may be considered part of the contract.

Rules of Interpretation

There are certain general rules which the court will always follow to get at the meaning of a contract. One is that in a printed form which has been filled out, if the written and printed words are inconsistent the court will disregard the printed words. If any words or phrases are inconsistent with the rest of the contract and a clear intention can be gathered from the rest without them, the court will treat them as superfluous.

If a general term is used, such as an agreement to do the "mason work" on a building, and it is followed by the mention of any specific kinds of mason work, such as "stone and brick work," "plastering," etc., it is a contract to do only the special kinds of mason work mentioned and not all the mason work on the building. In order to make a general contract for all the mason work, this intention should be clearly stated.

If any of the terms of a contract were intentionally made ambiguous by one of the parties for the purpose of taking advantage of the other party, the court will interpret the doubtful terms in the way that will least favor the party at fault.

In trying to decide what the parties intended where the meaning is doubtful, the court will be influenced by the words and the acts of the parties at the time of making the agreement, or by the manner in which they have carried it out since. Their manner of carrying out the conditions shows what they understood by the agreement.

Assignment of Contract

Any contract, as a rule, can be assigned by any party entitled to rights thereunder, unless it involves a personal element, or is prohibited by the contract itself. The proper method of assigning a contract is to indorse it. The indorsement is usually written on the back of the contract. Any form of assignment, however, which cuts off all control of the

assignor over the contract, will be sufficient. Liabilities under a contract cannot be assigned by a party.

The assignee receives the rights which the original party had. When a contract has been transferred to an assignee, he should always notify the other parties to the agreement. Unless such notice is given, the parties not knowing of the assignment may act in such a way as to prejudice the rights of the assignee.

Most of the things that a man may do for himself, he may do through another. Sometimes a person may do for another what he cannot do for himself. Thus a minor may act as the agent for a competent person in the execution of a contract, which he is without power to enter into on his own account.

Acting as an Agent

An agent is one who is authorized to represent and does represent another person in transactions with third parties. The person represented is known as the principal. The person appointed is known as agent, factor, broker, attorney, proxy, or representative. The relation existing between the principal and the agent is termed agency. Anyone capable of transacting his own business may appoint an agent to act for him in the same matters. The California Code expresses it as follows: "Any person having capacity to contract may appoint an agent." The person who appoints an agent must be, therefore, capable of transacting his own business; that is, when he appoints an agent, he must be sane, sober, and capable of acting for himself.

General Agents

There are two kinds of agents: general agents and special agents. A general agent is one authorized to assume entire charge of his principal's business, or all of some kind of business, or all of his principal's business at some particular

place. A general agent has unrestricted powers to deal along the line in which he is engaged.

Unless notified to the contrary, parties dealing with an agent have the right to presume that his agency is a general one, and that he is authorized to do anything usually done in such a business. In doubtful cases, however, for his own protection the third party should always ascertain the extent to which an apparent general agent has authority in the line in which he is dealing.

A purchasing agent is a general agent with power to bind his principal in contracting to buy materials on his individual judgment, and largely acting upon his own initiative. His employer controls and limits his general policy, but he does many specific acts at his own discretion, delegating authority in minor details to subagents who answer to him for what they do. In the same way, a sales department is the agent for a vendor, and the salesman is an agent—though usually not a general agent—of the sales department.

Special Agents

A special agent is one authorized to act in a specific transaction or in a limited line of business. The authority of a special agent is not so broad as the authority of a general agent. A special agent is authorized to do some special thing. He may make, for instance, but the one contract or the one sale for which he has been appointed. Should he do some other special thing, which he might honestly consider more to the interest of his principal, he would depart from his instructions, he alone would be liable and his principal would not be bound. In dealing with a special agent engaged for a particular transaction, the third party should ask to see the agent's authorization, which is usually in writing.

In any case where one acts as agent for another without authorization, his act may be ratified by the principal. Sub-

sequent ratification has the same effect as prior authorization. There are two ways in which a principal can ratify. He may do so expressly, or, by accepting the benefit of the action, he may imply his acceptance.

Liability of Principal

A principal is liable for carelessness, deceptions, false pretenses, or wrongful acts of any kind committed by an agent in carrying out the purposes of his principal. The principal is liable to third persons for any damages arising from the mistakes or the negligence of an agent while acting in his service, though he is not liable for the agent's acts not within the scope of his agency or employment.

An agent in any recognized position has the usual authority pertaining to his position, unless limitations are expressed in his contract with the principal. If he exceeds his real authority as between himself and principal, he is liable to his employer to that extent. He may be discharged from his position and he may be held for damages should he be responsible. If he perpetrates a fraud on a third party while transacting his principal's business, both principal and agent are liable and the agent will not be able to shift entire responsibility to his principal. In most cases where an agent deals with third parties, the third parties depend upon the agent to inform them correctly as to the extent of his authority. If the agent deceives them as to this, he makes himself personally liable to the third party to the same extent that he would if he had made the contract in his own name instead of that of his principal. If the agent has apparent authority but is limited by private instructions from his principal, he can nevertheless bind his principal by his contract within the scope of his apparent authority. In such a case, he is liable to his principal for any unwarranted action.

It is unsafe for a third party to deal with an agent without sufficient information as to his authority. Whenever dealing

with an agent, the purchasing agent should investigate to determine who is the principal and how far the agent's authority extends. To whatever extent he then accepts the relation of agency, to that extent he is dealing with the principal through the agent—the latter serving as the means of communication. When the contract is signed, the agent signs as agent and the principal, not the agent, is bound. After that, the agent is disregarded in the ordinary course of events and would not figure in the contract except as a witness able to give evidence in case of dispute.

Oftentimes in case of breach, it would be worth while to proceed with an action for the moral effect upon a vendor, whereas at other times it is more expedient to drop the case than to compel him to fulfil his part of the contract by court action. Any such situation requires careful and individual consideration, but usually it is better to keep matters out of court.

It is best always to prevent later difficulties which might lead to court action, by carefully observing the proper legal precautions in making the contract and in the effort made to secure its peaceful enforcement, rather than by attempting to collect damages by suit later on. And it is usually far better and cheaper for the purchasing agent and his department to secure a settlement in a contested case out of court than in court. Litigation, like war, is the last resort.

CHAPTER XXIX

ORGANIZATION AND PERSONNEL

Two Types of Purchasing Control

The difficulties involved in effecting an efficient purchasing organization are inherent in the nature of the work itself, as its activities must co-ordinate precisely with every department and every unit of the organization even though some may be situated in widely separated parts of the country. The difficulties in the way of an effective central purchasing control where the units are widely separated are many, and however effective the central control, the performance of subordinate purchasing functions at each plant cannot be eliminated. The main question of organizing the purchasing function of a scattered organization is the extent of authority to be given to subordinate functions.

Since the purchasing efforts must be co-ordinated, the work must be standardized under the direction of the central department. The subsidiary purchasing organizations will usually be permitted to order on their own judgment supplies for immediate needs, subject of course to the standards established by the firm and to all existing blanket contracts for those materials usable by the individual plants. To control the situation, copies of all orders for materials and supplies, wherever they may originate, must pass through the central office for its information and inspection.

Organization of Subsidiary Offices

The internal organization of each subsidiary purchasing department should be identical with that of the central de-

partment, whose organization is the subject of this chapter, although when the volume of work is sufficiently small the duties of several central office workers or groups may be combined in one in the branch office. The head of each subsidiary department usually has his hands strengthened to the extent of retaining the title of purchasing agent, his chief at the central office being known as the general purchasing agent.

The Central Office's Purchases for Distant Plants

The work of the general purchasing agent is not alone that of supervision, but is to direct and initiate all big things. His office keeps a careful record and check on all material ordered by the subordinate offices. He assists in determining standards and preparing specifications. He is responsible for co-ordinating his subsidiary departments with the other departments of their units.

From his position at the general office, he is acquainted at all times with the needs of the business as a whole and is enabled to initiate the placing of most contracts covering future requirements of materials and supplies for all plants. In fact, specializing on the big things, he will extend the ordinary range and quantity of contracts and, by so doing, he will obtain better prices than any of his subordinates could obtain in contracting for the needs of their particular plant alone because of the heavier purchase.

Control of Subordinate Purchasing Departments

The exact amount of responsibility which can properly be placed on the subsidiary organization depends upon the nature of the business and the personnel of the department. For instance, an organization which is able to place blanket contracts for over 90% in value of the materials which its subsidiary plants require, permits its subsidiary purchasing organizations to order practically all other materials wherever it chooses, to

place all emergency orders, and to write all orders for the delivery of materials covered by blanket contracts—the one requirement being that a copy of the purchase order be furnished to the central office. This secures the co-operation of the detached plant and saves time.

Thus on all important purchases the vendor, the price, and similar details are arranged in the contract made by the central organization of buying specialists; while on the less important orders, the judgment and arrangements made by the subsidiary department are carefully reviewed by the central office.

In another concern, by means of a "local order" form, the detached organization secures locally any emergency material, such as repair parts, supplies, or materials required to make up deficiencies. One copy of the order serves as a purchase requisition on the central office, which issues a confirming purchasing order for the material already delivered to the detached organization. While this keeps the control even more centralized, it adds clerical work without a compensating gain. Whatever the method of control, it must be simple, direct, and effective, especially if it is to avoid creating a red tape atmosphere.

The company which has all parts of its business located in one plant has a comparatively simple purchasing problem so far as the control of the work is concerned. Inasmuch, however, as the "scattered" type of organization—though its operation is more difficult—follows the organization and methods of the concentrated concern, the discussion of the detailed organization in this chapter is of the simpler type which is merely duplicated to adapt it to the scattered type.

Qualifications of a Purchasing Agent

The man who presides over the purchasing function—the purchasing agent or director of purchasing—needs to be a man of high ability and unusual qualifications. There has been much

discussion of the qualifications that the ideal purchasing agent should possess. Personality cannot be standardized. Different men will attain the same results by widely different methods. No man can quickly change his own personality to any great extent and retain his effectiveness. Generally speaking, the man who is anxious to succeed may borrow freely what is effective in others, but in the last analysis he must capitalize his own inherent qualities. The purchasing agent, like every other employee, must possess health, honesty, ability, initiative, a knowledge of the business, tact, industry, open-mindedness, sincerity, and enthusiasm. No one will have all these qualities in equal degree but no one need be absolutely disqualified if he falls below the average in one or two of them. His tactlessness, for example, may be forgiven because of his sincerity and enthusiasm. The best way of arriving at an estimate of the particular qualifications the purchasing agent should possess, is to review his duties somewhat in detail.

Duties of Purchasing Agent

First of all, he is the director and administrator of the purchasing department, exercising an oversight over all the factors involved and supervising the entire routine work from the checking of the purchase order requisition to the handling of claims. He is the point of contact between his organization and the sales world, and as such he must be tactful and sincere and the true representative of the ideals of his organization. He must have a certain and exact knowledge of the processes and principles, not only of purchasing but also of selling. He should have a knowledge of the business in which he is engaged, of the materials which it uses, and the processes of manufacture involved. He should know, in a general way, the quantities required, something of seasonal variations, and the general problems of his own concern relating to equipment, finances, and personnel. In short, he needs to be a bigger *man* than any

employee, and must possess in addition certain technical information regarding what he is to do and how he is to do it. If he has open-mindedness, tact, and the ability, he will be able to make a success of the work even though at the time he takes the position he is ignorant of many of the methods and principles involved in some parts of the routine. If he has the proper subordinates and wins their co-operation and good-will, he can soon make good his deficiencies. Subordinates with brains and knowledge are generally able to carry a business to success if the right man is at the head and is able to co-ordinate their work. In time he will have all that he needs to know and the business will be stronger and better than ever before.

As the organization of the purchasing department and the duties of its personnel are determined by the nature of the work to be done, a list of the routine operations performed with each order, will indicate the divisions of work within the department:

1. The discovery of the need of the material.
2. Writing the purchase order requisition.
3. Checking the requisitions with standard specifications, etc.
4. Securing quotations for the material.
5. Writing and placing the order.
6. Following up the order and effecting the delivery.
7. Recording and checking the invoice.
8. Receiving and checking the shipment.
9. Paying the invoice.

This tabulation summarizes the work in connection with a purchase order. As operations 1 and 2 are handled in the materials control department (see Chapter XVI), the purchasing department begins its work with operation 3 and ends with the completion of operation 7. The receiving and checking of the shipment is handled by the receiving department, while the paying of the invoice is the work of the accounting department.

In many respects the organization of the purchasing de-

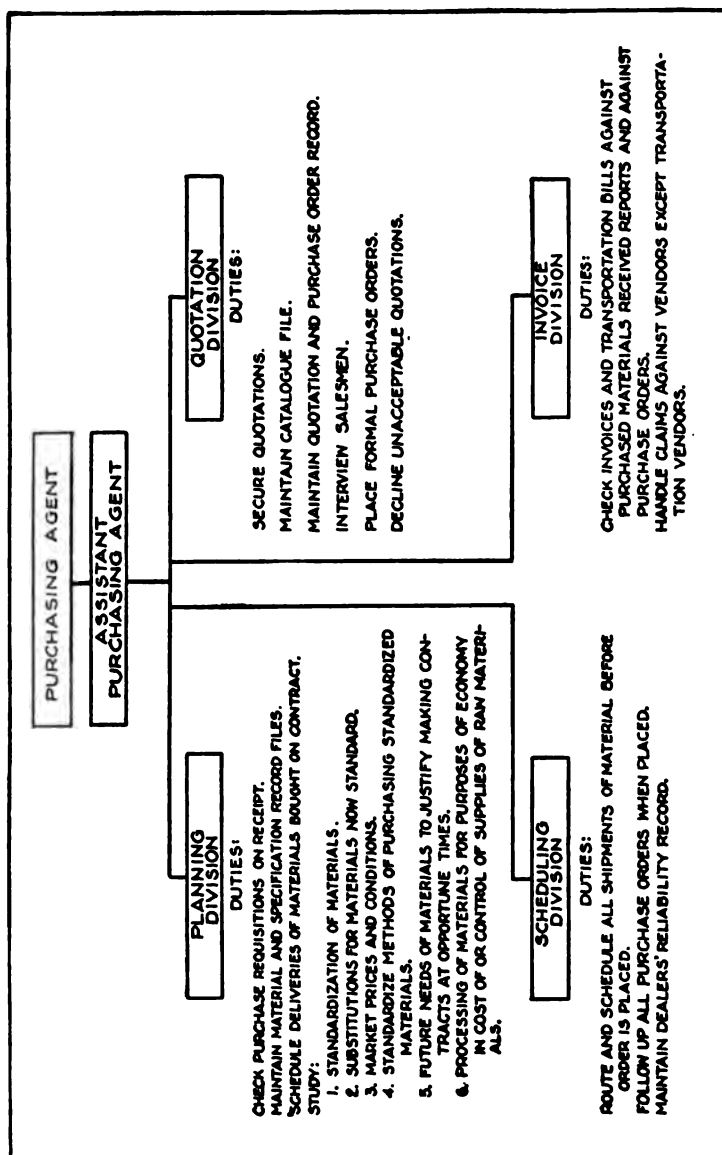
partment is on lines similar to the organization of the stores departments. Operations 3 to 7 constitute separate divisions of work and in a large organization each division has its own head who is responsible to the purchasing agent for the proper performance of its routine duties. This is shown in Form 91, "Chart of Purchasing Department Organization." In a small organization in which the purchasing department consists of only a few employees, the number of divisions will be fewer, one clerk performing two or more operations. Nevertheless each operation must be done by someone and, if possible, the organization should be laid out along the indicated lines.

In the division of the work the collection of statistical data as to the trend of the market and of other information of particular interest to the purchasing agent, is assigned as part of the work of the purchasing department, although in a large organization it might better be the task of a statistical department. In the same way the traffic work in connection with incoming shipments would devolve upon the purchasing department, only if there is no traffic department as described in Chapter II.

Planning Division

Like the planning division of the materials control department, the planning division of the purchasing department is the section which starts the departmental machinery in operation. It is the usual representative of the purchasing department in all work dealing with standardization, specifications, contracts, and similar matters. In the routine of purchasing, it supervises each transaction requiring individual judgment and attention. The records of market movements, of general sources of supply, the catalogue files and data of a general nature are in charge of this division. In other words, all the large phases of purchasing are handled here.

All incoming purchase requisitions are received by the



Form 91. Chart Showing Purchasing Department Organization

planning division head after having the quotation record attached. He then carefully reviews the requisition for accuracy and completeness of detail, particularly of specifications of quantity and quality and delivery date. If the requisition is not correct, it is returned to the originator. When approved, if the time for delivery is short, he indicates that fact and advises whether or not the order is to be placed at the same price as a past order without waiting for bids. If bids are to be requested, he notes on the requisition the vendors to be solicited, and passes it and the quotation record to the next division. There should then be no further cause for delay in the routine of purchasing.

Incoming circulars and correspondence addressed to the purchasing department should be opened and distributed by the head of this division. Such mail matter contains many suggestions and offerings from sellers of new materials which may be of interest. The planning division refers such information to the interested parties and receives their report as to whether the new material is worth consideration as the new standard. Thus the planning division is the chief point of contact between the purchasing department and the factory.

The assistant purchasing agent is the logical head of the planning division. However, if he is not technically trained, the member of the department who, next to his chief, is most adequately trained, should be selected. When thoroughly trained in the purchasing technique, he is a fit candidate as assistant purchasing agent.

Quotation Division

The planning division refers all purchase order requisitions after approval to a quotation clerk in charge of one or more assistants. It is his duty to send out inquiries for quotations and to interview salesmen who call in answer to requests for quotations. While no orders are placed without proper requi-

sitions, quotations offered by salesmen are acceptable at all times and are properly incorporated in the records.

In the organization of exceptional size where the purchasing agent or his assistant are such big men that they have no time to waste on the usual salesmen, individual members of the quotation division specialize in the general classes of materials purchased, such as the major raw materials, hardware, miscellaneous supplies, and so on, each interviewing all salesmen who offer his particular lines.

However, salesmen may upon occasion be referred to the purchasing agent, to another division, or even to a member of some other department. For instance, a salesman introducing a new product may be referred to the planning division to which he may deliver his information, although the quotation division member might well remain during the interview. If he calls regarding delivery on an order already placed, he would be referred to the scheduling division. The salesman, that is to say, would be referred to whatever party desires the information he has to give, while the point of contact still remains with the quotation division.

After the quotations are received and tabulated on the purchase order requisition, a choice of vendor is indicated on the requisition and signed. Then the requisition is passed to the typist for writing and distributing the purchase order. At the same time, unsuccessful vendors' bids are declined. When the order has been signed and forwarded to the successful vendor, the requisition is returned to a quotation division clerk so that the quotations secured on that material and the purchase order data may be entered on the quotation record, making it up to date and complete. Then all papers are permanently filed—the requisition by its serial number, the vendor's correspondence in the central filing department, and the quotation record in the quotation record file.

| The head of this division should have sufficient technical

knowledge to deal with technical salesmen on their own ground. The assistant purchasing agent often holds this assignment. Unless he can speak the language and follow the explanations of the salesmen, he cannot attain his full usefulness. He sees most of the salesmen and determines whether or not they are to see his chief, another party, or to be referred to another division. At times he has need of all the trader's qualifications of the purchasing agent himself, as it may be incumbent on him to obtain the salesmen's lowest prices and best terms on the spot. On his ability always to produce the desired quotation, order record, or catalogue, will largely depend the smoothness with which the department operates. His division is the repository of half the collected data and records that give the department its power and its superiority over the old system of random buying.

Scheduling Division

The scheduling division attends to all follow-up connected with incoming shipments. Should there be no traffic department, the scheduling division routes the incoming shipments, handles all transportation matters, and checks the freight bills. This division maintains the follow-up tickler file and carries on all correspondence, both with other departments and with the vendor, concerning the delivery of the material. This is the most important function of the division.

If the purchasing department retains direct control of all traffic details, the head of this division need be trained in all traffic details. If the traffic work is done elsewhere, he need be only a good correspondent and follow-up clerk. In any event he must be a diplomat of skill and resource, obtaining what he wants without losing the good-will of the vendors. Persistent but not offensive, he must effect his ends lest all efforts expended on the orders be wasted. He records his experiences on the dealers' reliability record of the follow-up files.

Invoice Division

The invoice division of the purchasing department checks all invoices, making certain that they agree with the purchase order terms and the receiving reports, so that when the final approval of the purchasing department is placed on any invoice, it is ready for payment and only the vouchering of the amount remains to be done. This division also handles all purchase claims.

The head of the invoice division should represent care to the last detail. It is here in this part of the departmental routine that inaccuracies most often appear and where they are most disastrous as tangibly expressed in dollars and cents. The division head should be a good executive with a high standard of accuracy and the power to impose a like standard upon his subordinates. There is also plenty of opportunity for the use of tact and diplomacy. Upon the harmonious adjustment of claims against vendors may largely depend their future goodwill and their willingness to continue to co-operate.

Assistant Purchasing Agent

In an organization of any size the clerks in charge of the divisions of work will be under the direct supervision of an assistant purchasing agent, who may also serve as a division head as suggested previously. Generally speaking, the chief function of the purchasing agent's assistant and division heads is to free the purchasing agent of detail so that he can give all of his time to consultation and to the larger aspects of his work.

Ordinarily, then, the assistant purchasing agent will be called upon to determine what matters should receive his chief's personal attention, what should be handled as matters of routine, and what he shall dispose of himself. He will himself then interview many of the salesmen who ask for the purchasing agent, eliminating those whose propositions cannot be entertained and arranging interviews for those who have some-

thing worth while to offer. He will review and sort the correspondence, handling a large part of it himself. He will be in constant consultation with the heads of divisions, passing on their problems himself or referring them to the purchasing agent. Finally, he will be responsible for the discipline of the department, directing the routine, and executing the policies of the department.

The assistant purchasing agent's personality and equipment will largely depend on his chief whose qualities he should supplement. If the purchasing agent is primarily a technical man, his assistant may well be first of all a trader. Generally speaking, he should be a man of a somewhat different type. The assistant may deal successfully with men with whom his chief can make little headway, and there are sure to be occasions when the desired result can best be brought about by having the assistant eliminate himself and permit the purchasing agent to take matters into his own hands.

The True Function of the Purchasing Agent

Successful purchasing is largely a matter of smoothly running routine, but the purchasing agent himself should stand quite apart from it. He should have the machine constantly under his eye, he should be able to watch every detail of its operation, he should be able to detect any lack of co-ordination, any friction, any failure of its parts to function perfectly; but he himself should not be a factor in its operation. The mechanism should run smoothly and efficiently whether he is present or not. He should be able to absent himself for any period of time with the knowledge that, so far as the task of supplying his organization with its staple materials and supplies is concerned, his presence is entirely unessential.

The type of purchasing agent who insists that every purchase order, whatever its size or the material it called for, should be decorated with his signature before it could be ex-

cuted, belongs to the dark ages of business organization and by insisting on such an absurd procedure today he proclaims either the inefficiency of his organization or a narrowness of mind that should be his own death warrant.

The modern purchasing agent demands that he be relieved of all detail. His desk will be clear; in fact it almost matters but little whether he has a desk or not. Yet his time will be constantly occupied. He will find employment for every moment that he is in his office, and perhaps he will be of most value to his organization in the quiet moments that he spends at home or in traveling, when he can think and plan.

His Characteristics

The purchasing agent, who has the standing in his organization that his position entitles him to will take his part in the executives' daily conferences. In view of the fact that it is he who is entrusted with the vast sums into which the expenditures of every company soon run, it is a short-sighted policy to treat him as though he were a head clerk whose sole function is to fill the requisitions filed with him by department heads. The modern purchasing agent is more than an order placer. He is a technician with a sound basal knowledge of the commodities with which he deals and of the processes of his own plant. He is a trader with a keen, critical, analytical mind, a good sense of values. He is a quick judge of human nature and he has an open acquisitive mind, vision, and a student's passion for research and information. He is a diplomat with a personality that invites friendship and meets it half-way, that keeps the good-will of the vendors even when he must say no, and who can command service, not because he is legally entitled to it but because men find it a pleasure to serve him. Lastly, he is an executive, not only because he has a department of his own to direct—in case of need his subordinates can do that for him—but because he must meet and deal with the other executives of

his organization on an equal basis. With these men he must maintain a constant relation of harmonious co-operation.

His Position in the Organization

As the head of a service department it is easy for the purchasing department to drop into a position of comparative unimportance, executing the requests that are made upon it, dodging trouble, avoiding friction, living from day to day but exerting no positive influence in the success of the organization as a whole. It is here that the amount of tactful aggressiveness that the purchasing agent brings to his work becomes a measure of his personal success and the value of his department to the organization as a whole.

In asserting himself by impressing his views on all of the units of his organization, backing them by his exact information and his technical knowledge, he should be able not only to save money but to improve his product, facilitate production, and strengthen the standing of his organization in the commercial world. Here is his field for initiative and originality and he should not hesitate to advance his facts before they are solicited, and sometimes even before they are welcome.

The wise management will aim to do whatever it can to strengthen the hand of its purchasing agent, not only in order to save time and money by really restricting every detail of purchasing work to a single department, but in order to help him to attain with the least effort his three great objects: the right article, with the most favorable delivery, and at the lowest price. Once let the idea get abroad that the purchasing agent is only a buffer between the salesmen and the men higher up, and the chief advantage of a single purchasing department is lost.

The purchasing agent, with the necessary qualities for his position, will be contented with nothing less than a free hand in his field. Such a man is sometimes called a purchasing en-

gineer and he ranks with the technical experts of the company in his specialized knowledge. Yet he has a breadth and vision that many of them lack and which transcends a knowledge of technical things and makes him at home in the mazes of finance, industrial and office management, transportation, and the great fenceless field called the market. Last, but by no means least, he will have an understanding of human nature itself and a mastery of the psychology of selling and of buying. Such a man will command a large salary but if he is worthy of his job he will often climb to the very head of the concern of which he is a part.

PART V
ADOPTING A SYSTEM

CHAPTER XXX

SYSTEMS, RECORDS, AND FORMS

Requirements of a System

System, regarded as the standardization of routine and methods, is necessary for the efficient operation of business. It is better to have a meager system reduced to the merest essentials and the most general outlines than to have no system at all. But better no system than to attempt to operate with methods that are not workable, or with plans properly devised but only half carried out. A system may be simple and yet effective. The chief consideration is that it be thorough and understandable and one which does not demand the impossible, otherwise it will fail.

The satisfactory system will avoid extremes and its plan and scope will be within the ability and experience of the individuals responsible for its operation. It will not leave human nature out of account. It will anticipate its errors and will not so much hope to eradicate them as to prevent them from doing harm. It will be carried out to the letter in all departments and in connection with every operation to which applicable. Before any system is introduced it should be worked out in all its details and should withstand criticism from every angle.

Systems Not Universally Applicable

The methods of control employed in any organization must suit the individual requirements of the business. No blanket system, record, or form is equally applicable to any two organizations without some modifications. Just as the personnel and

characteristics of the organizations differ, so will the systems employed. Just as no two persons are exactly alike nor able to execute the same task in the same way, so are no two business organizations exactly alike, nor is the business routine ever carried on in the same way in different plants and offices. Again, the details to be accomplished by one system are never precisely the same as in any other. For instance, the purchase order copies illustrated here would differ in some of their details in every plant to conform with special needs. Yet whatever may be the methods that serve as a systematic means of attaining a definite end, the general principles that underlie the methods remain the same.

Delegation of Authority

In planning a system there is one fundamental principle that should be constantly borne in mind. The executives should be relieved of all unnecessary detail. Whether or not they are willing to delegate their powers, it is extravagant to permit them to encumber their minds and waste their valuable time with anything of a routine nature that can be as satisfactorily performed by anyone else.

It is the executive's work to supervise. He should watch the total results and accomplishments and he should receive reports of them daily as a matter of routine. Complaints are another means by which he may be kept informed of the operation of his department. He or his assistant should review every complaint received. They indicate either a failure to function or some defect in system or method that requires attention. By investigations of this nature and by a careful analysis of the causes he can determine how his department is functioning as a whole, as sections, or as individuals. Should he thus convince himself that conditions can be improved, he must first determine whether the system or the personnel is at fault and act accordingly.

It is a matter of importance that as far as possible the responsibility for any particular transaction should be traceable. For this reason, on practically each form illustrated, spaces are provided for entry to indicate the person responsible for the transaction as well as to signify the completion of the job. The psychological effect of pinning down responsibility is that it leads to more accurate work. It is much easier to prevent errors than to adjust them afterward.

The efficient method by which to attain any object is usually the direct method. Methods that waste time and energy and fail to justify themselves, are evidence of red tape. Red tape is expensive to maintain in itself and is demoralizing to the spirit of initiative and energy which likes to get things done, and thus to the individual who comes into contact with it.

Revising a System

To revise a system a survey of the entire situation should first be made. Occasionally this is done by giving a questionnaire to each employee, on which he indicates the work he does and to whom he is responsible for its performance. When charted and tabulated, the answers to the questionnaires show the weak features of control and wherein the system may be advantageously revised or changed. But before the systematizer is competent to suggest changes he must master the details of operation, and understand the interrelations of departments and the peculiarities of the concern's problems. It may be that the present system is still the most practical but for lack of proper control has degenerated into an inefficient condition or it may be that methods are fundamentally at fault. Whatever the changes and improvements which may be suggested, it is well to reduce each department's work to a written manual, thus making certain that the duties are clearly defined and that there is a guide in case of any questionable items.

It should not be assumed that a system once developed and

organized will automatically work or justify itself by results. There should be a periodical survey to make certain that methods are being given a fair trial and to see what improvements can be made in them and what details, if any, can advantageously be shifted from one department to another. Nor must it be assumed that the maximum efficiency of a revised procedure will be secured immediately. There will be a temporary disorganization and in some cases disarrangement of the work, and until employees become familiar with the new methods, efficiency will not be maintained at its highest.

Records

Thus far we have discussed records only as they have formed part of the problems under discussion. Something may now be said of records in general. Whatever its nature, there are at least three things which may be expected of every record. It should be: reliable and adequate, available and timely, and permanent for future reference.

Reliability and Adequacy

Records are kept for the purpose of tracing expenditures for time and materials. Therefore, unless the figures are accurate, they are less than worthless and may be a positive detriment by being misleading. The maintenance of inaccurate records costs more than they are designed to save, for obviously whatever is spent for their upkeep is wasted. If they are worth keeping they are worth keeping well, and the secret of accuracy is a means of pinning down the responsibility for any inaccuracies that appear in them.

Records must be adequate if they are to serve the purposes of accuracy. An adequate record must present in full detail all pertinent information that may conceivably be required. These data should be kept in such a way that there will be a cross-reference to whatever may be the subject of the record.

To illustrate, any purchase order can be located as follows—knowing the material, by the record of quotations or by the stores records; knowing the purchase order number, from the purchasing department's serial file; knowing the requisition number, from the dead requisition file; knowing the vendor, from the follow-up file.

Availability and Timeliness

Records are made to be consulted. To that end they should be kept up to date and accessible to whoever may wish to consult them. It may be laid down as a fundamental rule that no record should ever leave its department. If it is placed in a permanent file it should not be removed from the file. If necessary, a memorandum may be made of its data. If the card be taken from the file, it should be replaced by a receipt signed by the borrower. This receipt or "out-card" is of a size slightly larger than the original so as to draw attention to the fact that a record is missing.

Timeliness is an important adjunct to availability. The information on a stores record is useless if posting is a week behind. A balance sheet two months behind schedule is a post-mortem statement of conditions. Records and reports should be scheduled to be completed at a certain time—and someone made responsible and then held to that responsibility.

While records must be readily accessible to those who need them, some of them may contain more or less confidential information which should not be open to everyone. Such records should be segregated and placed in charge of a confidential clerk. The bulk of the records here described are of a kind that can be freely consulted by all who have occasion to use them. Some organizations maintain distinct departments for maintaining routine records but these are not of material advantage except in the technical presentation and interpretation of statistics.

Permanency

All records should be permanent. A hasty pencil memorandum may be adequate for some things but if it is necessary to jot down facts in writing, in nine cases out of ten such memoranda should be a permanent record.

The method of recording the data should be standardized by the use of a suitable form. Entries should be made thereon legibly and in ink and in sufficient detail so that anyone may understand them.

The chief reason for making records of a permanent character is that while their value as isolated units of information may be slight or almost nil, their value increases as the units are built into totals for comparative purposes. The best guide to the future is a knowledge of what has happened in the past. For control purposes all past performances are of future interest and the close of a transaction does not end its importance. Most old records are valuable and should be stored where they are readily accessible as soon as the crowded state of a filing case calls for the removal of records that are no longer current. Those which are no longer of value may be destroyed.

Development of Records

The records, as described in these chapters, are suggestive only in regard to form. If all were to be installed, some would parallel and supplement others, thus duplicating clerical work without increasing the business gain. Like all other systems and forms, they must be modified to suit the peculiar conditions met in individual businesses, with due regard to need and use.

The records maintained in the purchasing department do not depend upon the organization or work of any other department. Every purchasing system demands the use of certain fundamental forms and records. The development of the stores and other records depends to a large extent upon the method of planning manufacturing orders and upon the desire

of the management to know the financial situation with reasonable certainty.

Purchasing Operations and Records

Each distinct operation in the routine work of a department should have its corresponding records, as illustrated in the routine of the purchasing department:

OPERATION	RECORDS
1. PRELIMINARY PLANNING	Here we have the catalogues of the vendors, materials records, trade paper clippings, and information as to sources of supply.
2. OBTAINING QUOTATIONS	The quotation record compiled from the catalogues, price lists, and the replies to direct applications.
3. WRITING THE ORDER	The serial purchase order file composed of the copies of purchase orders.
4. EFFECTING DELIVERY	The follow-up files on both vendor and transportation company.
5. CHECKING THE INVOICE WITH THE ORDER AND THE MATERIALS RE- CEIVED REPORT	The follow-up files of purchase orders from (4) and the files of the materials received reports

Forms—Advantages and Objections

There are obvious advantages to be derived from the use of forms, and there are but few disadvantages. On the whole, the former outweigh the latter.

Their primary use is to save time. As they are arranged to be filled out automatically and rapidly, they enable subordinates so to word their information that it becomes intelligible, complete, and reliable. Thus opportunities for mistakes and omissions are greatly reduced by their use. The routine of their preparation soon becomes a well-beaten track and any error is revealed by even a casual inspection. Essential data only is incorporated in the form and any failure to complete the

record is at once apparent. Moreover it is unnecessary to rely on the memory to include all items. The task becomes so plain that inexpensive clerical labor can handle even the most important papers under reasonable supervision. Only the unusual cases need be referred to the superior, and thus large organizations are able to handle a corresponding volume of work with speed and accuracy and at a comparatively low labor cost.

Forms Insure a Fixed Policy

A secondary use of forms is to prevent any deviation from the settled routine and system. Where they are employed there is a uniform procedure which does not change. Too much care cannot be taken with their construction but, like everything else devised by man, they are constantly open to improvement as experience and new conditions suggest changes and new contingencies have to be provided for.

It is held that a printed form is unable to command the attention and respect derived from a well written letter or explicit verbal instructions. Purchase order forms, for instance, containing many conditions detailed in their expression and printed in fine type, have an air of being stereotyped, and the vendor is quick to jump to the conclusion that they are not applicable to him. The remedy is to make the forms as explicit and concise as possible. They should fit the case precisely and should be discarded if they fail to do so.

As stated previously, the needs of an organization, the basic principles underlying their solution, and the philosophy surrounding those principles, must be understood thoroughly before a real revision of present methods is undertaken. Then, too much attention cannot be given to designing the systems, records, and forms to fit those needs.

But a correct system and its adjuncts cannot cure all evils and failings. Its forms, records, and routines are only

the tools by which control can be planned and scheduled in such a way that performance may be in accordance with needs and that any failure of performance to meet such needs may be known in time to apply corrective measures.

While the system furnishes the mechanism, it must be supplemented by sound judgment, by real work, and by strict attention to details. However, it can be stated without reservation that the systems, records, and forms of an organization clearly indicate the degree of closeness in the managerial control exercised by the organization heads.

INDEX

A

Acceptances (See "Trade acceptances")

Accounting,

- balance method, 49
- charging stores, account, 38
- inventories, 32, 39-57
 - charged to requisitions at actual cost, 58
- records, 107
- running total method, 50
- stores ledger, 39-57

Accounting Department,

- functions of, 19
- inventory taking by, 192
- invoice, handling of, 392

Accounting section,

- materials control department, 210

Accounts,

- classification, 95-96
- controlling, 32
- function of, 94-95
- work in process, 32, 129

Administration, 437-445

- materials control department, 14

Agencies,

- statistical, 293-296

Agency,

- law of, 415

Aisles,

- storesrooms, 160, 162

Alphabetic symbols, 91, 99

Appropriating material, 48

- form, 51

Assignment of contract, 414

Auditing division,

- functions of, 19

Authorization,

- purchases, 15, 54
- form, 53

B

Balance of accounts, 49

Balance sheet, 108

Bids, 331

- form, 332, 333

Bills of lading, 373

Bin tag, 172

- form, 173

Bins, 165

Blanket contracts, 288

Blue-prints,

- graphic production control, 229

Branch storesrooms, 167

Bribery, 321

Budget,

- inventories or stores, 30
- preparation, 109

Burden

- carrying charges on inventories, 132

- in process account, 130

- statement, 109, 128

Buying (See "Purchasing")

By-Product Stores,

- defined, 32, 33

C

Carrying charges,

- inventories, 132

Cash disbursement register, 400

- form, 399

Caveat emptor, 407

Charge symbol,

- stores requisition, 72

- Checking,
 - purchase orders, 286
- Checks,
 - requisition for, 395
 - form, 394
- Classification of accounts, 94
 - form, 97
 - relationship to classification of inventories, 111
- Classification of inventories, 31 94-106, 189
 - general stores, 96-99
 - form, 97
 - service department stores, 100
 - systems, 86-93
 - what to include, 53
- Component parts,
 - inventory tag, form, 195
- Component parts stores,
 - defined, 31, 33
- Continuous production,
 - as affecting materials control, 12
- Contracts,
 - assignment, 414
 - blanket contracts, 288
 - legal aspects, 401-418
 - mistakes in, 410
 - purchasing departments, 270-272
- Control board, 226, 234-237
 - registering progress on orders, 250
 - scheduling jobs, 245
- Control progress strips, 232
 - form, 235
- Cost department,
 - functions of, 19
 - inventory taking by, 195
- Cost-plus contracts, 338
- Costs,
 - actual, 65
 - actual versus standard, 64
 - average cost methods, 67
 - class cost methods, 117
 - current cost methods, 67
- Costs—*Continued*
 - distribution of, for material used, 121
 - elements of, 4, 28
 - estimating, 62
 - expense and burden statements, 128
 - expense ledger slips, 127
 - form, 127
 - job or order method, 117
 - journal entries, 125-127,
 - form, 126
 - ledger, 110-113
 - form, 112
 - manufactured material, report on, 60
 - form, 61
 - method of determining, 58, 67, 117
 - operation method, 118
 - pricing system to determine, 58
 - production sheets, 243
 - purchased material, 61
 - records, 118
 - handling, 119
 - reporting deliveries to stores, 125
 - returned goods, 123
 - stores requisitions, 121
 - summary of material used, forms, 122, 123
 - symbolization, 107-116
 - time cards, 119
 - standard versus actual, 64
 - statements, 109, 128
 - tabulating production order costs, 128
 - form, 129
 - work in process account, 129
- Counting machines, 167
- Credit,
 - information, 319
 - form, 315
 - stores returned, 78
 - form, 79

D

- Damage claims, 374
- Danger point, for quantity, 49, 81
- Defective and spoiled material, inspection reports, 248, 388
 - form, 389
- Delegation, of authority, 438
- Delivery from stores, 181, 213
- Delivery of purchases, 271, 349-352, 361-376
 - allowance for time in transit, 351
 - charges for, 340
 - conditions, 308-310
 - delays in, 361-368
 - forms, 363, 364, 366
 - difficulties, 350
 - effecting, 350
 - factory requirements, 351
 - follow-up of, 361-365, 369
 - forms, 363, 364
 - individual orders on contract, 348
- Delivery to stores, 70, 213
 - cost records, 124
- Demand (See "Supply and demand")
- Demurrage and damage claims, 374
- Direct Labor in Process account, 130
- Discipline,
 - secured by control of material, 7
- Discount, trade, 335, 342
- Dispatch board, 227, 237
- Dispatchers, 249
- Dispatching supervisor, 222
- Double-space storage method, 169
- Duplicate tag inventory method, 186

E

- Efficiency,
 - tested by inventories, 6
- Efficiency reports, 252
- Engineering Department,
 - functions, 22
- Estimates,
 - quantity required, 43

- Expense,
 - ledger slip, 127
 - form, 127
 - statements, 128
- Expense orders,
 - nature of, 37

F

- F. o. b. destination, 341
- Finished product,
 - inventory control, 139
 - inventory tag, form, 195
- Finished product stores, 16
 - defined, 31, 33
- Follow-up records, 229, 243
 - form, 230
 - purchase deliveries, 362-365, 369
 - forms, 363, 364
 - shipment of goods, 369-376
- Forms, 443-445
- Fraud, 411
- Freight rates, 372
- Future delivery,
 - stores, 77

G

- General stores
 - classification, 53, 96-99
 - form, 97
 - defined, 31, 33
- Graphic methods,
 - market analysis, 296
 - forms, 297, 299, 300, 301
- Graphic production control (See also, "Production control department")
 - advantages, 225
 - blue-prints, 229
 - control boards, 226, 234-237
 - control progress strips, 232
 - form, 235
 - cost sheet, 243
 - dispatch board, 227, 237
 - dispatching work, 247, 249

Graphic production control—*Continued*

- efficiency reports, 252
- follow-up records, 229, 243
 - form, 230
- forwarding requisitions to storage division, 247
- function, 224-226
- idle equipment report, 232, 250
 - form, 234
- idle time reports, 252
- inspection reports, 232, 248
 - forms, 233
- instruction cards, 229, 240
 - form, 231
- job registration, 248
- material credit cards, 229
 - forms, 232
- material requisitions, 229
 - forms, 229
- mechanism for, 226-253
 - forms, 227, 228, 230-236
- pay-rolls, 251-252
- posting accomplishments, 251
- progress records, 229, 243, 250
 - form, 230
- registering materials, available for production, 246
 - form, 36
- routing cards, 229, 243
 - form, 231
- scheduling jobs, 245
- standard machine practice card, 237, 240
 - form, 227
- standard parts list records, 227, 241
 - form, 228
- standard production analysis records, 229, 241-243
 - form, 228
- symbol code, 244
- time cards, 229, 243, 251
 - collection of, 249
 - form, 233
- Gratuities, 321

H

- Headings,
 - stores record, 52

I

- Identification cards, 229, 243
 - form, 231
- Idle equipment, 232, 250
 - form, 234
- Idle time reports, 252
- Importance of material control, 3
- Inspection Department,
 - functions, 21
 - inventory taking by, 191
- Inspection reports, 232, 248
 - form, 233
- Instruction,
 - arrangement of stores room in writing, 158
 - cards, 229, 243
 - form, 231
 - taking inventory, 187
- Interrupted production,
 - as affecting material control, 12
- Inventories (See also "stores")
 - account, 32, 110
 - charged to requisition at actual cost, 58
 - symbols, 114
 - adjustments, 68
 - balancing of, with stores record, 84
 - form, 83, 85
 - budget, 30
 - carrying charges on overhead, 132
 - classification (See "Classification of inventories")
 - consumption record, 137
 - form, 138
 - control of, 5
 - policies of, 131
 - procedure for, 134
 - co-ordinating requirements and schedules, 45

Inventories—Continued

- correlation with production and sales program, 27
- costs, how determined, 61
- future requirements, 139
- increasing stock of, 54
- issued, before price is known, 62
- new or replenished material, how determined, 54
- perpetual, 42
 - form, 43
 - limitation of, 53
 - pricing, 59
- quality 25, 26
- quantity available, 44
 - form, 45
- quantity control, 43, 44, 49, 133-138
 - form, 47, 138
- reconciling stores records, 59
- statistical reports, 31
- taking of, 183-200
 - accounting department, 192
 - checking counts, 185-186
 - classification of items, 189
 - cost accounting department, 193
 - directing, 188
 - duplicate tag method, 186
 - forms, 194, 195, 196, 199
 - inspection department, 191
 - instructions for, 187
 - materials control department, 190
 - necessity for, 184
 - period for, 188
 - physical, 184
 - preparations for, 187
 - pricing items, 198
 - production department, 190
 - purchasing department, 191
 - receiving department, 191
 - sales department, 192
 - salvage department, 191
 - storesrooms, 190

Inventories—Continued

- taking of—Continued
 - supervision, 197
 - tags,
 - forms, 193-198
 - test of efficiency by, 6
 - time needed to procure, 25
 - up keep, 25
 - unclassified, 54
 - valuation, 31
 - loss from deterioration, 68
 - verifying, 180
 - withdrawn when exhausted, 54
 - work in process account, 32
- Invoice,
 - received,
 - adjustments, 390-392
 - checking of, 382-385
 - forms, 386, 387, 391, 393, 394
 - payment of, 377-379, 392
 - registration of, 379
 - routine, 377-384
 - voucher register, 395-400
 - forms 393, 394, 396, 398, 399
- Invoice division,
 - purchasing department, 429

J

- Jobs,
 - scheduling on control board, 245
- Journal,
 - entry, 125-127
 - form, 126
 - voucher,
 - form, 126

L

- Labor,
 - direct,
 - work in process account, 130
- Layout,
 - storesroom, 159
- Ledger,
 - Cost ledger, 110-113

Ledger—Continued

- relationship of various kinds, 111-114
 - form, 112
 - stores, 39-57
 - (See also "Stores records")
 - work in process, 120
- Location,**
- change of,
 - form, 179
 - of stores on requisition form, 74
 - storesroom, 159
- Loose-leaf methods, 41, 126**

M

- Mail-order delivery, 181**
- Management,**
- phases, 3
- Manager,**
- production control department, 221
- Manufactured parts received report, 124**
- Manufactures** (See also "Finished product," "Parts," "Production")
- various types affecting material control, 11
- Manufacturing,**
- cycle, 6, 32
 - material received reports, 71
 - relation of materials control department to, 17
- Markets,**
- analysis, 293-310
- Material credit cards, 229**
- forms, 232
- Material in process account, 130**
- Material received reports,**
- manufactured materials, 71
 - purchased material, 70
- Materials** (See also "Inventories," "Purchasing," "Stores")
- issued on specifications, 78

Materials—Continued

- not on hand, 78
 - form, 77
 - quality or grade, 25, 26
 - record, 282-285
 - registering available, 246
 - form, 236
- Materials control,**
- elements of, 5
 - functions of, 25
 - importance of, 3
 - steps in establishing, 183
- Materials control department,**
- accounting section, 210
 - administration of, 14
 - estimate of consumption and balances, 307
 - functions of, 15, 201
 - general storeskeeper, 202
 - inventory taking by, 190
 - organization, 201-213
 - chart, 205
 - planning section, 206-208
 - procedure for ordering, 17
 - recording section, 208-209
 - relation to plant, 17, 201
 - scheduling section, 209
 - storage division, 211
 - chart, 212
 - supervisor, 221
 - weekly report, 306
- Mechanical handling of,**
- stores, 164
- Monthly cost reports, 107**

N

- Numerical symbols, 91, 99**

O

- Office manager,**
- functions, 22
- Office supplies,**
- control of, 140

Order control supervisor, 221
 Order requisition (See "Purchase requisition")
 Order to stock material, 54
 form, 55
 Ordering point, 49, 81
 form, 47
 Ordering quantity, 49, 133-138
 form, 47, 138
 Orders (See also "Expense orders," "Plant-increase orders," "Production orders," "Purchase orders")
 classified, 36
 nature of, 36
 procedure for, 17
 symbols, 115
 Organization, 9-22
 chart,
 form, 20
 elements of, 11
 lack of, 9
 manufacturing types affecting, 11
 materials control department, 201-213
 chart, 205
 production control department, 217-223
 chart, 218
 purchasing, 419-433
 purchasing department, 272

P

Parts,
 standard parts list record, 80
 storesroom for, 16
 Pay-rolls, 251
 Personnel,
 Production control department, 220
 Piling of stores, 174, 176
 Planning division,
 materials control department, 206
 purchasing department, 424
 Plant-increase orders,
 nature of, 37
 Posting,
 accomplishments, in production control, 251
 mechanical methods v. hand, 82
 stores requisition, 78
 Prices,
 based on performance, 337
 competitive, 334
 consideration of, 334
 contract record, 328
 form, 329
 current, 338
 definite, 337
 determining, 268
 fixing, 289, 336
 kinds of, 305-308, 336-340
 list, 339
 maintenance, 335
 net, 339
 Pricing,
 actual cost methods, 65
 actual cost versus standard, 64
 advantages, 58
 average cost methods, 67
 current cost method, 67
 estimating, 62
 inventory items, 198
 known before material is issued, 62
 recording, 58, 60
 requisitions, 64-68
 unit values, 58
 how determined, 60
 Principal and agent, 417
 Procedure,
 Illustration of, 34
 Production,
 continuous or interrupted, 11
 correlation with inventories, 27
 material control, relation to, 4
 program, 27
 co-ordinating requirements with, 45
 quantity control, 136

- Production control department (See also "Graphic production control")
 - dispatching supervisor, 222
 - functions, 217
 - manager, 221
 - materials control supervisor, 221
 - order control supervisor, 221
 - order handling procedure, 218-220
 - organization, 217, 223
 - chart, 218
 - personnel, 220
 - relations with, materials control department, 202
 - tool control supervisor, 223
- Production departments,
 - advance information, to purchasing department, 350
 - inventory taking by, 190
- Production orders,
 - administered by materials, control department, 15
 - estimate for, 139
 - handling procedure, 218-220
 - nature of, 36
 - routine, 239
 - tabulating costs, 128
 - form, 129
- Profit and loss, statement, 108
- Progress and follow-up records, 229, 243
 - form, 230
- Purchase contracts,
 - blanket, 347
 - cost-plus, 338
 - discharge of, 349-352
 - features of, 347
 - individual orders, 348
 - form, 354
 - invoice, 377-384
 - records, 328
 - form, 329
 - time for completion, 352
- Purchase orders (See also "Delivery of purchases," "Delivery to stores")
 - accuracy of, 323
 - administered by materials control department, 15
 - blanket contracts, 288
 - contract record, 328
 - form, 329
 - delays in delivery, 361-368
 - forms, 363, 364, 366
 - follow-up, 362-365, 369-376
 - forms, 363, 364
 - forms, 354, 355, 356, 359
 - individual, on blanket contract, 348
 - inspection for accuracy, 357
 - manufactured part received report, 124
 - maximum and minimum quantities, 43
 - material received reports, 70
 - nature of, 36
 - progress reports, 368
 - price fixing, 289
 - quantity, 288
 - quotations and past records, 328-331
 - form, 330
 - receiving and checking goods, 385-390
 - forms, 386, 387, 389
 - record of supplies on order, 44
 - form, 45
 - routine, 353-357
 - rush orders, 368
 - ship and trace, 368
 - form, 366, 367
 - shipment of goods, 369-376
 - vendor's acceptance, 358-360
 - form, 360
- Purchase requisitions, 285
 - checking, 286
 - contents, 80
 - control of, 289

Purchase requisitions—Continued

- features of, 80
- form, 81, 285
- questionable, 276
- routine, 81
- time allowed to complete, 350

Purchasing,

- bids, 331
 - form, 332, 333
 - bribes, 321
 - confidence between seller and buyer, 326
 - correlation of factory demands with market conditions, 395
 - credit information, 319
 - form, 315
 - departmental buying, 258
 - discount, 335, 342
 - elements of good, 261
 - fundamental considerations, 273-289
 - gratuities, 321
 - legal aspects, 317-319, 401-418
 - market analysis, 293-310
 - form, 295
 - payments, 342
 - personal ties between seller and buyer, 317
 - prices, 334-346
 - purchaser's requirements, from vendor, 324
 - sales contracts, 311
 - seller and buyer, 311-327
 - specifications for, 278-281
 - technical knowledge, 276
 - time needed to procure, 25
 - transportation charges, 340
 - use of data, 286
 - vendors, information on, 308
- Purchasing agent, 259, 430-433**
- assistant, 429
 - attitude toward salesman, 314-317
 - duties, 422
 - integrity of, 321

Purchasing agent—Continued

- personal relations of, 263
 - qualifications, 421
- Purchasing department,**
- agent, 259
 - central office, 420
 - contracts, 270
 - deliveries, 271
 - filling out the order, 266
 - function, 265
 - good buying, 261
 - inventory taking by, 191
 - invoice division, 429
 - markets, knowledge of, 267
 - materials, record, 282-285
 - organization, 272, 419-433
 - chart, 425
 - place in manufacturing procedure, 6
 - planning division, 424
 - prices, determining, 268
 - profits through savings, 260
 - quotation division, 426-428
 - records, 262
 - relation to plant, 17
 - reputation of, 263
 - scheduling division, 428
 - service record, 325
 - form, 326
 - sources of supplies, 308-310
 - form, 309
 - specialized purchasing, 259
 - specifications in, 153, 278, 281
 - subordinate departments, 420
 - subsidiary offices, 419
 - vendors, selection of, 267

Q**Quality,**

- control of, 25, 26
- inspection of, 388
- selection of, 273

Quantity,

- control of, 25, 26, 43
- danger point of ordering, 49

Quantity—Continued

- estimating requirements, 45
 - keeping track of, 44
 - ordering quantity and ordering point, 49
 - form, 47
 - production control, 136
 - purchase control, 43, 133-138
 - form, 47, 138
 - purchase orders, 288
 - stores requisition record of, 72
- Quotation division,
 purchasing department, 426
- Quotation file, 328-331
 forms, 309, 326, 330, 332, 333

R

- Raw materials,
 inventory tags, form, 194
- Raw materials stores (See "General stores")
- Receiving department,
 inventory taking by, 190
- Recording section,
 materials control department, 208
- Records, 440-443 (See also "Stores records")
 functions to be covered by, 25
 purchasing department, 262
- Remittance letter, 397-400
 form, 398
- Renewal of stock,
 how determined, 54
- Requisitions (See also "Purchase requisition," "Stores requisitions")
 check, 395
 form, 394
 entered upon a stores record, 59
 pricing, 64-68
 procedure for, 17
- Research department,
 to determine quality, 26

- Routing,
 stores requisition, 75
- Routing cards, 229, 243
 form, 231
- Ruling,
 stores record, 42
- Running total method of accounts, 50
- Rush orders, 368

S

- Sales,
 correlation with inventories, 27
 law of, 401-418
 program, 27
- Sales department,
 inventory taking by, 192
- Sales price,
 elements of, chart, form, 29
- Salesman,
 report on customer, 313
 form, 315
- Salvage department,
 inventory taking by, 191
- Salvage stores (See "By-product stores")
- Scheduling division,
 materials control department, 209
 purchasing department, 428
- Scrap stores (See "By-product stores")
- Service department stores,
 classification, 100
- Ship and trace, 368
 form, 366, 367
- Shipment of goods,
 bills of lading, 373
 demurrage and damage claims, 374
 follow-up, 369-376
 routings, 375
 transportation charges, 371
- Shipping order,
 stores requisition, copy of, 73
- Signal tags, 233
 form, 236

- Skids, 166
- Space, storage, 163
- Specifications, 153
 - purchases, 278-281
- Standard parts list record, 80, 241
 - form, 228
- Standard practice records, 227, 240
 - forms, 227, 228, 230
- Standard production analysis records,
 - 229, 241-243
 - form, 228
- Standardization of materials, 142-149
 - advantages, 143
 - control of, 145
 - determining, 144
 - examples of, 147
 - specifications, 149-155
- Standing orders (See "Expense orders")
- Statistical reports, 31
- Storage units, 165
- Storage workers, 156
- Stores (See also "By-product stores," "Component parts stores," "Finished product stores," "General stores," "Inventories")
- Stores control (See "Materials control")
- Stores department,
 - administered by materials control department, 15
 - function of, 13
- Stores records, (See also "material received reports")
 - accuracy of, 83
 - form, 83
 - balancing of, with inventory, 84
 - form, 83, 85
 - complete set necessary, 16
 - functions, 17
 - form, 18
 - ledger, 39-57
 - appropriated material,
 - form, 48, 51
- Stores records—*Continued*.
 - ledger—*Continued*
 - balance method, 49
 - forms, 43, 45, 46, 47, 51, 55, 56
 - headings, 52
 - information in, 40
 - method of keeping, 41
 - opening, 52
 - purposes of, 39
 - reconciling balances, 59
 - ruling, 42
 - running total method, 50
 - unclassified stores with form, 56
 - perpetual inventory card, 42
 - posting, 82
 - pricing, 58-69 (See also "Pricing")
 - stores balance sheets, 49
 - forms, 43, 45, 46, 47
- Stores requisition,
 - charge symbol, 72
 - corrections on, 75
 - form, 76
 - cost record, 30, 121
 - countersigned, 75
 - features of, 71
 - form, 72
 - filing, 181
 - forwarding to storage division, 247
 - future delivery, 77
 - location designation, 74
 - material and symbol, 74
 - material not on hand, 78
 - form, 77
 - material of exceptional value, 76
 - posting to ledger, 78
 - production requirements, 229, 245
 - form, 232
 - quantity record, 72
 - routing of, 75
 - shipping order, 73
 - substitute for, 80
 - time wanted, stated on, 75
- Stores returns, 78
 - cost records, 123
 - form, 79

- Stores system,
 importance of, 27
- Storesrooms (See also "Storage")
 aisles, 160, 162
 bins, 165
 branch storesrooms, 167
 counting machines, 167
 decentralization of, 16
 delivery system, 180-182
 forms, 181
 finished goods and parts, 16
 general location of, 16
 inventory taking by, 190
 layout, 159
 location, 159
 materials control department division, 211
 chart, 212
 mechanical aids, 164-167
 planning, 156
 size, 160
 skids, 166
 space, 163
 storage of material, 156
 storage units, 165
 trucks, 166
 written directions, 158
- Stowage, 168-182
 forms, 173, 175, 179, 181
 bin tag, 172
 form, 173
 change of location, 179
 form, 179
 counting materials, 177
 double-space method, 169-170
 distinct storing, 171
 identifying materials, 172
 piling materials, 174, 176
 removal of goods, 178-179
 special items, 170
 surplus stock, 174
 form, 175
 systems, 168
 unit of, 176
- Supplies stores (See "General stores")
- Supply and demand, 303-304
- Symbols,
 alphabetic and numerical, 91, 99
 charge, on stores requisition, 72
 classification systems, 89-91
 cost records, 107-116
 general stores classification, 96, 99
 form, 97
 inventory account, 114
 on stores requisition, 74
 orders, 115
 standard operation symbol code, 244-245
 storage spaces, 163
- System, 437-445
- T**
- Tags,
 inventory forms, 193-198
 inventory method, 186
 signal tags for control board, 233
 form, 236
- Terms of sale, 308-310
- Time cards, 119, 229, 243, 251
 collection of, 249
 form, 233
 on control board, 245
- Time wanted,
 stated on stores requisition, 76
- Tools, control supervisor, 223
- Trade acceptances, 343-346
 form, 344
- Traffic department,
 functions, 21
- Transportation charges, 340, 371
 checking of, 384-385
- Trucks, 166
- U**
- Unclassified stores, 54, 56
 form, 56
- Unit price, how determined, 60

V

- Valuation,
 - inventories, 31, 68
 - recording price, 58
- Vendor,
 - acceptance of purchase orders, 358-360
 - form, 360
 - data for, 319
 - information concerning, 308
 - personal contact with, 313
 - purchasing agent's attitude toward, 314-317
- Voucher,
 - journal, form, 126

Voucher—*Continued*

- register, 395-400
- forms, 393, 394, 396, 398, 399

W

- Warranties, 407-409
- Work in process (See also "Graphic production control")
 - account, 32
 - burden in process account, 130
 - control accounts, 129
 - control of, 140
 - inventory tag, 196
 - ledger, 120
- Worked materials stores (See "Component parts stores")

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